

FIFTH

ANNUAL REPORT

OF THE

PRESIDENT AND DIRECTORS

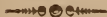
TO THE

STOCKHOLDERS

OF THE

BALTIMORE AND OHIO

RAIL ROAD COMPANY.



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FIFTH ANNUAL REPORT.

THE President and Directors of the Baltimore and Ohio Rail Road Company, in presenting their fifth annual report, feel highly gratified in being able to congratulate the stockholders upon the increasing success, which has thus far attended the operations of the Company. The construction of the road, during the interval which has elapsed since the last annual report of the Board, has been steadily advancing with great activity; and there now remains no doubt, but that the first five divisions, extending from the city of Baltimore to the Potomac river, a distance of $67\frac{1}{2}$ miles, as well as the lateral road to Frederick, will be opened for travelling during the present year.

Under the authority given by the City Council of Baltimore, a line of Railway has also been laid from the termination of the main stem of the Road, at the Depot, near Pratt street, down that street to the Basin, whence it is now under construction to the City Block, running parallel with the entire water front of the City, communicating with all the wharves, and intersecting all the principal streets which extend northwardly and southwardly, as far down as the public property south of Jones' Falls, at which place there have been conveyed to the Company, by the Corporation of Baltimore, two squares of ground, favourably situated for the convenient and economical

transaction of an extensive commerce. An uninterrupted communication will thus, within a few weeks, be opened along the whole extent of the Road, between the Port of Baltimore, the Potomac river at the Point of Rocks, and the City of Frederick.

Upon this line a double set of tracks are nearly completed over a distance of twenty-seven miles; and a single set of tracks is also so nearly finished over the remaining forty-six miles, as to leave no doubt of its early completion. The requisite arrangements have likewise been made to secure the construction of the second track, along the whole line, to the Potomac river, during the ensuing spring.

When the work shall have been finished to the Point of Rocks, the operations of the Company, which have heretofore been interdicted beyond that place, by the injunction issued at the suit of the Chesapeake and Ohio Canal Company, must necessarily be suspended, unless a decision of the question of right should, in the mean time take place, or the Canal Company agree to compromise the dispute. The delay which this litigation has already occasioned, is the more to be regretted, as there is no reason whatever to doubt, but that if a spirit of accommodation existed on the part of the Canal Company, sufficient room would be found, for both works along the ground in dispute, even should that Company still adhere to the idea of extending their work to Cumberland—indeed, so far as the examinations have been made by the Engineers of the two Companies, it is fully ascertained that there is ample space for both the Rail Road and the Canal at a very inconsiderable additional expense.

The very great improvements which, within a few years past, have been made in the construction of Rail Roads, and in the machinery employed upon them, have given to this system of transportation, so decided an advantage over all the other artificial means of intercommunication heretofore attempted, as to have inspired an almost universal confidence in it, both in our own country and in Europe. A Railway is now constructing between New York and Philadelphia, and another across the

peninsula between the Chesapeake and Delaware Bays, to connect with the steam boat travelling between Baltimore and Philadelphia; these works are fast approaching towards completion; and will, when finished, ensure an easy and rapid communication between those three great commercial emporiums, reciprocally beneficial to them all, and vastly increasing the travel and intercourse between them. By constructing a Railway from Baltimore to Washington, this line of communication would be extended from New York to the Capitol of the United States.

Impressed with the importance of accomplishing this last object, in which the convenience of the whole community is so deeply interested, and believing that the road, if judiciously located and constructed, would afford a fair remuneration to the Stockholders, the Board have directed that during the present season the necessary examinations and surveys should be made for the purpose of ascertaining the facilities which the intermediate country offers for a Rail Road, and the approximate expense of its construction. In this duty the chief Engineer of the Company with an efficient force has for some time been engaged.

The Legislature of Maryland, during the last session, passed an act which, among other provisions, authorized the Baltimore and Washington Turnpike Road Company to subscribe \$100,000 to the stock of the proposed road to Washington, and reserving to the state the right to subscribe for five-eighths of the cost of the road, from its intersection with the Baltimore and Ohio Rail Road to the line of the District of Columbia, amounting perhaps to a moiety of the whole proposed expenditure.

The Directors being desirous of procuring their steam machinery, as far as practicable, of American workmanship, and anxious to direct the mechanical genius of this country to its further improvement, offered a premium for the best constructed Locomotive Engine, which should be placed upon the road on or before the 1st of June, 1831, limiting the performance to a certain rate of speed and power of traction. Only one Engine has yet been offered, which on trial, appeared to be adapted to the structure of our road—this Engine it is be-

lieved, taking into consideration its weight, is, in point of efficiency nearly if not quite equal to any locomotive yet tried.

From the experiments which the Board have been enabled to make with it, they have fully ascertained that steam power may be used, on the Baltimore and Ohio Rail Road, at a rate of speed and economy of cost, which will fully realize the most sanguine anticipations of the Company; arrangements are accordingly now in train to procure a sufficient number of Locomotive Engines of a weight and construction suitable for the travel and transportation on the road. These it is expected will be in readiness by the time the two sets of tracks shall be completed to the Potomac river, and until then, the transportation on the western divisions of the road will be effected by horse power.

The graduation of the inclined planes at Parr Ridge is nearly finished, and they will very soon be in readiness to receive the Rails. It is contemplated to place the necessary stationary Engines with their appropriate fixtures there, as early as possible; and in the mean time horse power will be employed in passing them.

Considerable progress has been made in the improvements at several of the Depots of the Company, by the construction of substantial and appropriate buildings, and other requisite accommodations, adapted to the commerce of the road; and from the warehouses of the Company upon Camden street, a Railway will be laid up that street for the convenience of the return trade. These arrangements will, it is believed, secure to the public, in the use of the road, every necessary facility and convenience.

As it was early foreseen that a very considerable commerce would be attracted to the city of Frederick, when the road should be completed to that place, the interests, both of the public and of this company required, that a sufficient extent of ground should be procured, and the improvements necessary for the operations of the Company erected there. The municipal authorities of that city with a liberality not less honourable to themselves than gratifying to this Board, generously offered to

convey to this Company, free of cost, six acres of land, immediately adjoining to that city for a Depot; several of the citizens of Frederick also offered to obtain, without any charge to this Company, the right of way for the lateral road leading from the main stem to this Depot—these valuable grants were accepted by the Board, and the necessary conveyances have been duly executed.

The Depot at Frederick is so situated as to secure from it, an easy communication by lateral Railways into all parts of that city; the Company will therefore be enabled to receive produce or deliver freight upon any street where the inhabitants may extend the rail way, and open suitable warehouses for the accommodation of the trade.

The system organized for the regulation of the business of the Company, and for the government of its agents, has, in its operation, been found to be efficient and practical, clearly defining the duties of the several officers and maintaining a strict responsibility in every department. It is also with sincere satisfaction, the Board can inform the Stockholders that notwithstanding the complicated operations of the Company, requiring numerous agents, whose duties rendered it necessary they should be dispersed over an extensive district of country, the utmost harmony and fidelity, with the exception of a single instance referred to in the accompanying documents, have pervaded all the departments; and a most laudable disposition has every where been manifested by the officers and agents employed, zealously to co-operate in the advancement of the work, and in reciprocally giving to each other a cordial and efficient aid and support in the discharge of their several duties. This disposition has greatly facilitated the operations of the company, and very much abated the labours of the Board.

Upon reference to the report of the chief Engineer of the Company, and to the reports of the Superintendent of graduation and masonry, and of the Superintendent of construction, which are hereto annexed, the Stockholders will find a minute and circumstantial exhibit of all the operations of the Company, in relation to the location and construction of the road, subsequent to the time of the last annual report, down to this date,

as well as of several highly valuable improvements which have, within the same period, been made in the machinery and moving power employed upon it. By these reports it appears that the actual cost of graduation and masonry upon the 71 miles between Baltimore and the Point of Rocks, including the lateral road to Frederick, will not exceed \$1,101,615 or \$15,500 per mile;* and that the cost of a double set of tracks upon the main stem of the road, and of a single set on the lateral road to Frederick will not exceed \$805,238 or \$11,628, per mile of road with a double set of tracks, thus making the total cost of graduating the entire line of these portions of the road and of laying the Rails upon them \$1,906,853 or \$27,128 per mile. About one-third of this line will be laid with stone Rails, and the remaining two-thirds with wood.

In this charge is included the heavy expenditures incurred on the first division of the road. According to the report of the Superintendent of graduation and masonry, herein before referred to, it appears that the graduation and masonry of the 2d, 3d, 4th and 5th divisions of the road embracing the entire line between Ellicotts' Mills and the Potomac river, and extending over a distance of $54\frac{1}{2}$ miles, will cost \$465.443 or \$8.540 per mile; if to this be added \$11.628, the average cost of laying a double set of tracks, on the entire line between Baltimore and the Point of Rocks, the actual cost of graduation, masonry and laying a double track of rails on the road between Ellicotts' Mills and the Potomac, will be \$20.168 per mile, and this district, it is believed, may be assumed as affording a fair specimen of the labour

*Upon reference to the annexed report of the Superintendent of graduation and masonry, a detailed statement of the separate cost for graduation and masonry upon the several divisions of the road, intermediate to the city of Baltimore and Potomac river, as well as of the lateral road to Frederick, will be found.

By this report, it appears that the graduation and masonry upon the first division of the road, embracing 13 miles, and extending from the city of Baltimore to Ellicotts' Mills, has cost \$46,354 $\frac{56}{100}$ per mile, whilst the graduation and masonry upon the other four divisions, embracing $54\frac{1}{2}$ miles, and extending from Ellicotts' Mills to the Potomac, will cost only \$8,532 $\frac{16}{100}$ per mile. That the graduation of $12\frac{1}{2}$ miles of the road near to Baltimore has cost as much as the graduation of the remaining $54\frac{1}{2}$ miles will cost.

That the masonry on $8\frac{1}{2}$ miles of the road near to Baltimore, has cost as much as the masonry on the remaining $58\frac{1}{2}$ miles will cost.

And that the graduation and masonry together, has cost on the first 11 miles of the road 33,000 dollars more than it will cost on the remaining $56\frac{1}{2}$ miles.

and expense which will be incurred on the remaining line of the road from the Point of Rocks to the coal mines in Allegany county.

The entire line of the road, from the Depot of the Company, near the intersection of Pratt street and the Washington road, at Baltimore, to the Point of Rocks is $67\frac{1}{2}$ miles, to which is to be added for the distance thence to the eastern termination of the Rail way at the City Block 2 miles, and for the Branch road to Frederick $3\frac{1}{2}$ miles, making the whole distance finished and under construction 73 miles. The excavation, embankment and masonry upon nearly $46\frac{1}{2}$ miles of which have been completed within the last twelve months; and upon which there has also been laid $45\frac{1}{2}$ miles of single tracks of Rails within the same time.

In deciding upon the materials of which the Rails should be formed, the Board have continued to pursue the determination adopted soon after the commencement of the undertaking, which was in all cases where stone Rails could be procured, to use them, and in those districts where stone of a suitable kind could not be obtained, to use wood of the best and most durable quality the country afforded. Throughout the district intermediate to the Patapsco and Potomac at the Point of Rocks, no stone of a quality suitable for Rails has been discovered, and consequently upon this district wooden rails have, of necessity, been substituted. For the same reason a wooden viaduct, supported by substantial stone piers and abutments, has been constructed across the Monocacy river.

Although the first track on the 2d division of the road was completed several months since, yet as both tracks on this section will be of stone, and the second one has not yet been finished, it was found that the running of passenger cars upon this part of the road greatly interrupted the work, and would considerably retard its completion; the general travelling has, therefore, not been extended beyond the first division of the road, a distance of 13 miles.

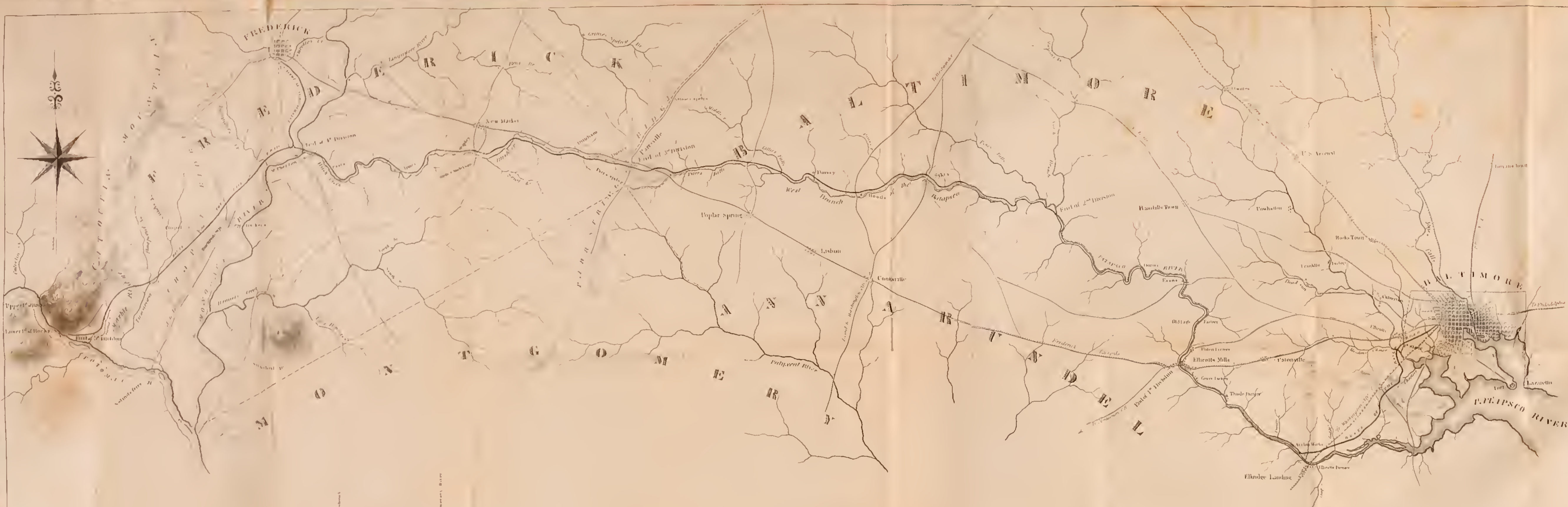
Upon reference to the report of the Superintendent of Transportation, hereto annexed, it will be seen that 81,905 passen-

gers have passed on this division since the first of January last, and that within the same period 5931 tons have been transported upon it, yielding an income of \$31.405²⁴/₁₀₀ and involving an expenditure of \$10,994⁸⁷/₁₀₀.

With the foregoing results before them, the Board have no hesitation in assuring the Stockholders of their entire confidence, that when the legal obstructions, which now arrest the progress of the work, shall have been removed, the remaining distance of the road, between the Point of Rocks and Cumberland may be completed, with a double set of tracks, within three years; and they are fully confirmed in the opinions heretofore expressed, "that a Rail Road upon the plan contemplated by the citizens of Baltimore, between that city and the Ohio river, is easily practicable—that its powers and facilities will be found to be equal to all the anticipations that were formed of its capabilities, when the work was first commenced, and that the most sanguine calculations of its importance and utility, whether the object be regarded with reference to its national and local advantages, or its profits to the Stockholders, will be realized."

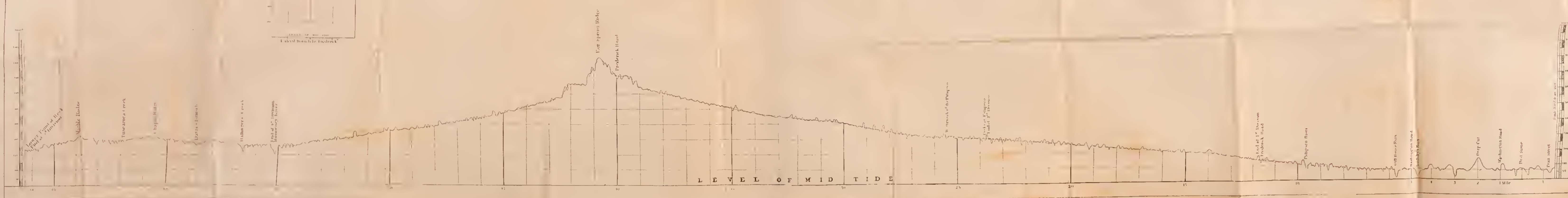
PHILIP E. THOMAS, *President.*

October 1, 1831.



Map
AND
Profile
Route
OF THE
BALTIMORE & ANAPOLIS RAILROAD
FROM
Baltimore TO THE Point or Rocks,
AND OF THE
LATERAL ROAD
TO
FREDERICK.

SCALE
Two Miles to an Inch.



*Second Annual Report of the Chief Engineer of the Baltimore
and Ohio Rail Road.*

**Engineers Office, Baltimore }
and Ohio Rail Road. }**

Baltimore, October 1, 1831.

TO PHILIP E. THOMAS,

President of the Balt. & Ohio Rail Road Co.

IN accordance with the regulations of the Company, I now present my second annual report, detailing the proceedings of this department for the last twelve months, and embracing such operations as will claim attention within the next year.

Every effort has been made to realize the expectations which were formed, and the assurances that were given, that the road would be opened for travelling both to the Point of Rocks on the Potomac river, and to the city of Frederick within the year 1831; and notwithstanding the generally unfavorable state of the season during the last autumn and the unusual severity of the winter, the work has been prosecuted with such activity that fully as much has been accomplished as was expected; leaving no reason to doubt but that the road will be opened to those places with a double set of tracks on the first and second divisions, and with a single set of tracks on the other portions, within the time anticipated.

The details of the proceedings of the Company since the last report, will be stated under the following heads:

1. The graduation and masonry.
2. The construction of the railway.
3. The location of the route.
4. The machinery and moving power.

And I shall also embrace the subject of the introduction of the railway into the improved parts of the city of Baltimore, as well as that of the proposed railway to Washington.

The Graduation and Masonry.

Previous to the last annual report, the graduation and masonry had been completed upon the city division and upon the first

division to Ellicotts' Mills, a distance of thirteen miles; and likewise, with the exception of the great rock excavation at Ellicotts' Mills, upon the second division, to the Forks of Patapsco.

Fifteen miles of the third division, in continuation from the second division, had also been placed under contract; so recently however, that very little progress had been made upon it.

Since the last annual Report, the excavation of the Tarpeian rock at Ellicotts' Mills, and the graduation and masonry on the fifteen miles of the third division, completing a distance of forty miles from Baltimore, have been finished.

During the last autumn and winter, a distance of about sixteen miles, reaching to the Point of Rocks on the Potomac, and comprising about five miles of the fourth division, along the ravine of Bush creek from Ijams' mill to the Monocacy river, together with the whole of the fifth division from thence to the Point of Rocks, as also the viaduct across the Monocacy, were placed under contract.

The graduation and masonry on the five miles along Bush creek, and upon a part of the eleven miles of the fifth division were completed during the early part of the present year, and the entire residue, including the viaduct, will soon be finished.

In the month of June last, the graduation and masonry of the residue of the line between Baltimore and the Point of Rocks, comprising a distance of twelve miles, including the inclined planes across Parr's ridge, were contracted for. The dividing point of the third and fourth divisions is on the top of that ridge; and of the twelve miles just mentioned, about $2\frac{3}{4}$ miles are on the third, and $9\frac{1}{4}$ miles on the fourth division.

About the same time the work upon the lateral road to Frederick, a distance of $3\frac{1}{2}$ miles from the main stem at the Monocacy, was likewise placed under contract.

The work upon these portions of the line has been prosecuted with uncommon vigor, and with a view to its being prepared for the reception of the railway in time for the attainment of the object herein before mentioned.

The graduation, masonry, and bridging, being under the superintendence of Caspar W. Wever, the report which that vigilant officer is expected to make to the Board, will complete the necessary details in relation to this branch of the service.

The Construction of the Railway.

In the early part of the last year, a double track of rail way was finished from Baltimore to a point near the Patapsco, and a single track from thence to Ellicotts' Mills was also completed. Contracts had also, in August 1830, been made for laying down the residue of the second track to Ellicotts' Mills, including about $6\frac{1}{2}$ miles, and likewise for laying the first track on the second division from Ellicotts' Mills to the Forks of Patapsco; in length twelve miles.

These tracks have been completed in a substantial manner with granite sills, except for short distances on high embankments, where wood was preferred.

It was expected that the two tracks to Ellicotts' Mills, and the first track to the forks of Patapsco would be completed during the autumn of 1830; but the length of time required to procure the sills from the existing quarries, and to construct the track in so substantial a manner, rendered this impracticable. The consequence has been, that the completion to Ellicotts' Mills took place in the winter, whilst the 12 miles of track above the Mills were not finished until the middle of June last.

A contract has also been made for laying down the second track of the second division, with granite sills. This work has been judiciously prosecuted by *Enoch Sweat*, who had heretofore evinced his ability and zeal as a contractor in the service of this Company. Of the 12 miles of track embraced in this contract, only $1\frac{1}{2}$ miles remain to be laid; and the entire double track to the Forks of Patapsco, 25 miles from Baltimore, will probably be completed by the 1st of November next.

The first track to be laid on 15 miles of the third division was contracted for in the last autumn; but owing to circumstances which will be explained in the documents accompanying the report of the Superintendent of Construction, a disappointment has been experienced in this part of the work.—From the measures which have been adopted however, and which will be pursued with regard to the work on this division, it is believed, that the first track will be completed by the 1st of November next. Of this track $5\frac{1}{2}$ miles will be laid with granite sills, and the residue with wood. Materials are in preparation for a second track on this division.

Contracts have also been made for laying the first track

on the remainder of the third, and on the whole of the fourth and fifth divisions, to the Point of Rocks, and likewise upon the lateral road to Frederick; together with the second track upon a part of the distance embracing Parr's ridge: and it is expected that these contracts will be completed by the close of the year 1831.

From the circumstance, that stone suitable for sills, had not been found contiguous to the upper part of the third division, nor upon the fourth and fifth divisions, including the lateral road to Frederick, it became necessary to lay the first track through these distances, with wood instead of stone: and from the necessity there will be for having the use of a second track, previous to the time when it could be finished with stone to be brought from a great distance, by means of a conveyance on a single track, which would at the same time be much, if not fully, occupied with the public trade and intercourse, it is worthy of consideration whether it will not be for the interest of the Company and the public, that the second track on part of the third, and on the whole of the fourth and fifth divisions, should not likewise be laid with wood.

The reason for this step will be much strengthened from the consideration, that the facts developed on the first and second divisions indicate, that embankments should be allowed a period of from two to three years at least, to settle, previous to receiving a railway constructed of stone sills.

In this way, the road would come into profitable use at an earlier period, and it is believed that the advantage to accrue from this circumstance would more than compensate for any loss that would be consequent on the decay of the wood.

When the wood shall decay, the tracks can be repaired of stone sills, or in any other method that shall have been approved.

About 40 miles of single track will have been laid with stone sills, by which the relative advantages between their use and that of wood in the formation of the railway, will be tested, as regards the first cost, durability, repairs, and facility to the motive power.

Since the last annual report, a contract has been made with John McCartney for the extension of a single track of stone and iron railway along Pratt street within the improved parts of the city. This enterprising contractor is executing the work in a very satisfactory manner, and already the track has been laid to the basin.

During the present season there have been erected a permanent carriage house, weigh house, &c. on the ground conveyed to the Company by James Carroll, Esq. A depot has also been established at Ellicotts' Mills, on which there has been erected a permanent warehouse. There has likewise been a depot established at the city of Frederick, as well as within the city of Baltimore, near the basin, upon the latter of which a suitable house is erecting.

For a more full account in relation to the construction of the railway, depots, &c. I refer to the report of Jacob Small, Superintendent of Construction, hereto annexed, marked A, and to the documents accompanying the same, in which will be found a lucid narrative and statement by his principal assistant, James P. Stabler.

The Location of the Route.

In accordance with a resolution of the board, the requisite steps have been taken to revise the location of the residue of the third and the whole of the fourth and fifth divisions to the Point of Rocks, and also to locate the lateral road to Frederick city.

For this purpose it was arranged that Caspar W. Wever, Superintendent of Graduation and Masonry, who had just closed the field duties requisite for the revision of the location upon the greater part of the third division, should continue his labors in this service. And in order that due time might be allowed for the consideration of questions relating to the system of inclined planes across Parr's Ridge, a random line of survey and levels was by him extended across the ridge and down Bush creek to a point beyond any supposed influence to arise from the system of planes which might eventually be adopted in passing that ridge.

From this point, near Ijams' mill, to the end of the fourth and beginning of the fifth division, on the west bank of the Monocacy river, and including a distance of about five miles, the line was duly revised and staked out for contract by that officer, according to the principles which I approved.

This part of the line occupies the most narrow and crooked part of the ravine of Bush creek and extends to the junction of that stream with the Monocacy. It required the exercise of no ordinary skill and judgment to lay the line in such manner as to give space for the passage of the stream on the one hand, and so as not to encounter, to an improper extent, the precipitous and

rocky projections of the hills, on the other; and at the same time to keep the curvatures sufficiently gentle and regular.

The location has been made so as not to have the radius of curvature less than 440 feet. One point of hill is passed with a few hundred feet having this radius, whilst in every other part, the radius of curvature is greater than 500 feet.

In the experimental lines which had been previously run, curves of radii less than 400 feet had been here employed. The grades were also reduced so as not to exceed a descent towards the Monocacy at the rate of 24 feet per mile in any part.

The Superintendent also continued the location on the fifth division from its commencement to Ballinger's creek, a distance of about $1\frac{1}{2}$ miles. In addition to which he also attended to the necessary surveying and levelling required for the location and staking out for contract the route of the lateral road connecting the main line at the west bank of the Monocacy, with the city of Frederick.

The field notes and levels of these several parts, and the maps and profiles of the route of the main line from Ijams' mill to Ballinger's creek, have been reported, and are on file in this department.

The Assistant Engineers, Henry J. Ranney and Ralph S. Smith, who had aided in the field duties of the revision of the third division, and George T. Dunbar, John W. Smith, and Benj. A. Alderson who had assisted in the calculations, were detailed to continue their services under C. W. Wever in the revision of the main line.

The revision of the line from Ijams' mill to Ballinger's creek, as before mentioned, having been concluded, and having also just been placed under contract for the graduation and masonry; it was no longer convenient, on account of the press of business appertaining to his office, for the Superintendent to continue the field operations upon the location of the main line after the 30th of November.

I therefore resumed this duty personally, and completed the location and staking out for contract the residue of the fifth division from Ballinger's creek to the Potomac river at "the Point of Rocks," a distance of about $9\frac{1}{2}$ miles; in which service I was aided by the assistants already named, and by Benj. H. Latrobe, who had recently been employed as an assistant in superintending the laying of the railway on the second division.

The line throughout the fifth division passes over a country the surface of which is undulating; nevertheless the route is remarkably direct: and as regards curvature, it is almost equiva-

lent to a straight line. There is no curvature in eleven miles, the extent of this division, of less radius than 1146 feet, and only about one-fourth of a mile having a less radius than 1910 feet, whilst the entire length of the straight parts is eight miles. The maximum grade upon this division and upon the lateral road is 30 feet per mile, and will therefore be within the advantageous range of the action of locomotive steam engines.

The maps and profiles have been executed, and are, together with the notes of the survey and levels of the located line from Ballinger's creek to the Point of Rocks, on file in this office.

These surveys were completed on the 27th of December last, the time having been considerably extended in consequence of the shortness of the days and the inclemency of the season.

During the last spring the necessary examinations, surveys, and levels were made to effect the final location of the remaining part of the line between Baltimore and the Point of Rocks, to wit, the part including the crossing of Parr's Ridge, in length about 12 miles. The staking out for contract of this part of the line was completed on the 6th of June last. The maps and profiles have been executed, and are, with the notes and calculations, deposited in this office.

In making this part of the location I was assisted by the gentlemen already mentioned, with the exception of B. H. Latrobe, who had been detailed to run and stake out the centre line and curvatures of the graduated surface of the third, and parts of the fourth and fifth divisions, preparatory to the laying of the railway.

For a description of this part of the line, and the principles which governed in its location, reference is made to my report dated the 6th of June last, and which is hereunto annexed, marked B.

The document just referred to contains statements of the sections and quantities of excavation and embankment as calculated at the time of making the location, to be necessary to effect the graduation.

Similar statements for the residue of the fourth division, for the fifth division, and for the lateral road to Frederick, are contained in the tabular exhibit, marked C, annexed.

I also annex a tabular statement, marked D, prepared by B. H. Latrobe, and containing the distances, grades, and radii of the curvatures on the line of the Baltimore and Ohio rail road from the depot first established on Pratt street, to the Point of Rocks, and to the city of Frederick.

I herewith further present a map and profile of the final location of the line to the extent just mentioned, as drawn by Joseph Shriver, who, it is proper to say, also assisted B. H. Latrobe in tracing the centre line on the graduated surface of the third division, to guide in the laying of the railway.

Having been charged with the investigation of the eligibility of introducing the railway into the improved parts of the city of Baltimore, that subject was attended to, and received the consideration due to its importance. A copy of my report upon this subject dated the 3d of February last, accompanies this report, and is marked E.

Immediately on my completion of the location of the fifth division to the Point of Rocks, I was instructed to make a reconnaissance of the country lying between the city of Baltimore and the city of Washington, with a view to ascertain and report upon the apparent facilities afforded for the location and construction of a railway that should connect Baltimore with the seat of the general government.

This duty was performed to the extent which the inclemency of the winter, at the time, permitted; and a report thereon was made on the 22d of January.

In making this reconnaissance, I was assisted by B. H. Latrobe; and was also aided by the facts developed in the survey of a route for a canal, made for the United States, by Dr. Wm. Howard. And I take this occasion to acknowledge myself indebted to that gentleman and also to Capt. Wm. Gibbs McNeill, and to Col. J. Abert of the U. S. Topographical Bureau for a view of the maps and profiles of that survey.

After the location across Parr's ridge was completed, I was directed to take the necessary steps, without loss of time, towards effecting the location of the route of the proposed railway to Washington.

Two parties were accordingly organized, the one under the immediate direction of Henry J. Ranney, and consisting of Ralph S. Smith, leveller; John W. Smith, surveyor; Benj. A. Alderson, draftsman; and John Small, jr. and Charles G. Hanson, calculators: and the other under the immediate direction of B. H. Latrobe, composed of Albert M. Lea, leveller; George T. Dunbar, surveyor; Oliver C. Morris, draftsman; and Henry H. Krebs and Wm. K. Coulter, calculators.

These officers commenced the preliminary surveys and levels on the 15th and 18th days of July last, respectively, and continued their operations with due diligence until about the 1st of September, when, from the unhealthiness of the season and

of the country bordering on the Patuxent, several of them became seriously ill of bilious fever, and it was therefore necessary to suspend the field operations until a more healthy season should return. These operations, it is hoped, may soon be resumed; and they will be unremittingly prosecuted until the location, together with the calculations, maps, and profiles, shall be completed.

I had expected to have personally superintended and directed all the preliminary surveys which would be required previous to the location of the Washington road, but other duties claiming my attention, it became necessary that these surveys should be made under written instructions that would embrace, in a great degree, their extent, together with the manner, method, and principles, upon which they should be conducted.

In elucidation of this subject there is hereto annexed a copy of these instructions, dated the 6th of July last, marked F, to which is likewise necessarily attached a copy of my report of the 22d of January, heretofore mentioned.

The Machinery and Moving Power.

Advances have been made since the last report towards the perfecting of the turn-outs, and likewise of those parts of the cars subject to friction, wear, and fracture.

The turnouts have been modified so as to adapt them more perfectly to the object. A single switch is used, the position of which is in the rail across which the turnout is directed. The pressure of the inner side of the flange against the switch when thrown open, together with the greater circumference of the opposite wheel rolling with the flange on the cast iron plate, effectually guides the car in the direction of the turn-out, and with but little additional friction.

At first, it was thought to be necessary to lessen the breadth of the track at the turn-outs in consequence of the great play which had been given to the flanges on all the other parts of the road, to wit, $1\frac{3}{4}$ inches: experience, however, has brought us to adopt the same breadth of track at the turn-outs as in other parts of the way, namely 4 feet $9\frac{1}{4}$ inches between the iron rails; and an entire uniformity of breadth is now preserved throughout.

It has been found necessary to give some additional strength to the wheels and axles, to preserve the former from fracture, and the latter from flexure. The diameter of the axle has been increased from $2\frac{3}{4}$ to $2\frac{7}{8}$ inches, and the weight of the wheel from 175 lb. to 205 lb. The diameter of the wheel continues to be 30

inches, whilst the breadth and thickness of the rim and of the spokes have been somewhat enlarged.

The cylindrical and conical form of the face of the wheel remains as at the first, excepting that the rise of the conical part has been changed from a ratio of 1 to 6, to that of 1 to 5; whilst the breadth of this part, which was one inch, has been increased $\frac{3}{16}$ of an inch. The rise next to the flange is therefore now $\frac{1}{4}$ of an inch instead of $\frac{1}{6}$ as formerly.

This change was induced from a conviction that the motion of the cars would, in general, be rendered steadier, and with considerable velocities, easier in the extreme curvatures. It was also believed that the effects of chilling would be greater, whilst the cone would be more durable; at the same time, the experiments on friction justified the conclusion that no lateral thrust would result from this increase.

Experience so far, appears to confirm all these expectations; and it is believed, that a decided improvement has thus been effected.

The cone now used, will answer for three feet wheels upon curvatures of road of 400 feet radius, and hence, wheels of that diameter can be employed for the use of the Locomotive Engines.

In the use of the Winans car, it was found that greater strength, and hardness of texture, in the friction wheel, were requisite, than was at first apprehended. Greater strength to withstand shocks, and hardness to preserve from the attrition and wearing at the periphery bearing upon the end of the axle. It is believed that these defects have been remedied to a great extent, and so as to secure the practical success of this improved car. Improvements in the box containing the friction wheel and the oil, have also been effected.

It is evident, that the durability of the road and of the cars, and especially of the wheels, would be promoted by the use of springs interposed between the load and the running gear. This precaution would also increase the efficiency of the moving power.

The concussions upon the rails, caused by the undulatory action of a rigid frame, bearing a heavy load, are very considerable, and they are greatly augmented by an increase in the rapidity of the movement.

From unavoidable deviations of the plane of the surface of the rails from that of the bearings of the car, the pressure of the weight frequently becomes transferred to three and even to only two of the four wheels, and this transference of pres-

sure and consequent concussion, is continually varying upon the wheels diagonally across the carriage.

The employment of springs would however, not only greatly tend to equalize the pressure under these varying circumstances, upon all the wheels; but would likewise greatly lessen the concussion and its effects.

It has been found absolutely necessary to the comfort of passengers, that carriages used for their conveyance, should be mounted upon springs, or upon some equivalent elastic fixture. Now the jars and concussions that would destroy the comfort of the passenger, become increased with a load of stone, minerals, or of agricultural products, or with any other loading having a less elasticity than persons, and although the articles of traffic may not be damaged, yet, the effects upon the carriage and road will be injurious.

The chief disadvantage to be apprehended from springs, is their cost, but should this be more than returned in the increased durability of the cars the investment would be profitable.

Under these considerations, it is recommended that a number of burthen cars shall be furnished with springs in order to test their advantageous use in such cars.

From experiments which have been made on the Baltimore and Ohio Rail Road, the traction with the use of the Winans car upon a level, straight road, was found to be the $\frac{1}{450}$; and making a reasonable allowance for unavoidable defects, it is believed, that in practice, the traction will be the $\frac{1}{400}$ of the weight of the car and load.

It was mentioned in the last report, that two kinds of cars were used upon this road. and that it was intended each should receive its utmost improvement.

This subject has continued to claim attention, and will be pursued until a fair comparison can be made of the relative merits of each.

The other car works with an outside bearing and chilled boxes, and is more simple and cheap in its structure. The traction with this car, according to the experiments, was the $\frac{1}{258}$, which, allowing for defects, may probably be increased to the $\frac{1}{240}$ th of the weight of the car and its full load.

The diameter of the end of the axle subject to friction, is the same in each of these two kinds of cars, to wit: two inches; and it is probable that a less diameter than this, would not answer in the Winans car. The circumstances attending the wear of the parts in the chilled box car are, however, different from those of the other; and there is reason to believe, that a less

diameter than at present, may be used. It is probable that a diameter of $1\frac{3}{4}$, or even of $1\frac{1}{2}$ inches, might be sufficient; and if so, the traction would at once be reduced from the $\frac{1}{240}$ th to the $\frac{1}{295}$ th, which would produce a gain in the effective power equal to about 23 per cent.

Experiments were also made to ascertain the resistance occasioned by a curvature in the road of a radius of 400 feet, and it was found when the Winans car was used, to be equivalent to that which would arise on the straight parts of the road, from an ascent of 1 in 1418, equal to 3.72 feet per mile: and of 1 in 356, or 14.83 feet per mile, when the other car was employed.

In order to test the practicability of turning the corners of streets in the improved parts of the city, with a track of railway, experiments have likewise been made to ascertain the facility of turning a right angle in a given space, by means of the flanges of two of the wheels rolling upon the longer rail, the curved part of the track being one-fourth part of the circumference of the circle.

It was found that a radius of 60 feet, which is very little more than a calculation upon the depth of the flange would give, was the most expedient length for this object; and that the passing of a car through the curve was attended with the least friction, when the wheels which rolled upon their flanges, were guided in their proper direction, by means of the flanges being made to run in a groove in the rail, whilst the shorter rail remained of the usual form.

A turnout and curve upon this principle has been laid down at Ellicotts' Mills, to communicate with a viaduct which the enterprising proprietors of the extensive merchant flour mills there, have constructed across the Patapsco. To pass through this curve requires a traction of $\frac{1}{49}$ for the Winans car, and of $\frac{1}{45}$ for the present chilled box car.

It is proper to remark that the flanges of all the wheels used, are chilled, and that it is necessary that the grooved rail should also be chilled, to be durable.

In making these experiments, as well as in the arrangement of the machinery, I have been aided by my assistants John Elgar and Ross Winans. The latter gentleman is now engaged in planning the machinery and fixtures for the inclined planes.

Recently a chilled box car has been constructed in such a manner as to permit the axles to vibrate. This arrangement is quite simple, and is effected by permitting the box to move

backward and forward through a small arc. In this way the motion of the wheels is more free, and the axles may conform more to the direction of the radius of curvature of the road, giving greater effect to the cone, so that the resistance in curvatures, and in passing through turn-outs, will be much reduced. This car works well, and the method bids fair to be a valuable improvement.

Full effect should be given to this plan, and at the same time it should be ascertained whether both ends of the axle should be allowed to vibrate, or only one of them.

Although this modification of the chilled box car with outside bearings, may ultimately enhance its value, and bring it more nearly into competition with the Winan's Car as respects the amount of traction required, yet, further experience is necessary before their relative merits in all respects, and under all circumstances, can be ascertained.

It is, however, gratifying to know, that whilst our endeavor still to improve them, implies some degree of imperfection, the present state of either of these cars is in advance of that which would be necessary to ensure the success of rail ways.

For the report of John Elgar, assistant of machinery, see paper marked G. annexed.

In pursuance of the public call upon American genius, made by the Directors, three locomotive steam Engines were produced upon the rail road, one only of which has been made to answer any good purpose. This Engine was built at York, Pennsylvania, by Phineas Davis, and after undergoing certain modifications, was found capable of conveying 15 tons 15 miles per hour, on a level. It has been employed on that part of the rail way between Baltimore and Ellicotts' Mills, and generally has performed the trip out to the Mills in an hour, with four cars, being a gross weight of about 14 tons. About 5 miles of the road ascends at an average rate of about 17 feet per mile.

The Engine is mounted on wheels made for the common cars, of 30 inches diameter, and the velocity is attained by means of gearing with a spur wheel and pinion upon one of the axles. The axles work in friction wheels, similar to those of the Winans car. The curvatures are traversed with facility by this Engine. Its greatest velocity for a short time, on the straight parts of the road, has been at the rate of 30 miles per hour, whilst it has frequently attained that of 20 miles, and has often travelled in curvatures of 400 feet radius, at the rate of 15 miles per hour. The fuel used is the anthracite coal, which has been found to answer the purpose well.

The performances with this Engine, have, therefore, fully confirmed the opinion advanced in the last annual report, that locomotive Engines may be successfully used on a rail way having curves of 400 feet radius.

This Engine, however, weighing only about $3\frac{1}{2}$ tons, is too light for advantageous use upon ascents.

Taking into view the strength of the road where wood is used in the construction, it is believed, that it would not be advantageous to employ Engines of greater weight than about $4\frac{1}{2}$ tons, and the Engine now upon the road affords a good index as to the requisite quantity of steam, and likewise of the proportions of the various parts, which should prevail in those that are to be constructed.

As a further illustration of the machinery and fixtures herein referred to, and now used on the Baltimore and Ohio rail road, and of the methods employed in constructing the rail way, I have annexed the following drawings, executed by B. H. Latrobe, to wit:

1st. A drawing of the friction wheel of the Winans' car, showing

A vertical section of the friction wheel and box.

A lateral view of the same.

Plans of the lower and upper divisions of the box.

2d. Drawings of Elgar's improved turn-out—comprising a general view of it, and representations of its several details.

3d. Drawings of the chilled cast iron car wheel—exhibiting different parts by appropriate views and sections.

4th. Drawings of the car used for the transportation of flour, shewing—an end view, side view, and plan of the car—together with the manner of stowing the barrels.

5th. Representations of the various modes of constructing the Rail way employed on different sections of the Baltimore and Ohio Rail Road, displaying the details of a construction—

Of stone sills.

Of wooden string pieces and sleepers.

Of wooden string pieces and stone blocks.

The work to be performed in the ensuing twelve months, and for the probable cost of which, estimates are annexed, marked H, will consist of the completion of the graduation and masonry on the main line to the Point of Rocks, and on the lateral road to Frederick.

The completion of the two tracks of rail way to the Potomac

at the Point of Rocks, and of the single track to the city of Frederick, together with the necessary depots.

The requisite stationary machinery to be placed upon the inclined planes at Parr's ridge.

The continuation of the rail way within the improved parts of the city.

The construction of cars and locomotive steam Engines, to be carried on as fast as practicable and expedient.

The location of the route of the lateral rail way to Washington, which it is expected will be completed at an early day, so that the work of construction may be commenced within the year. No estimate can however, be made of the probable cost of constructing this work, until the surveys and calculations shall have been finished.

Respectfully submitted,

J. KNIGHT,
Chief Engineer.

*First Annual Report of the Superintendent of Construction of
the Balt. and Ohio Rail Road.*

[A.]

Office of Construction B. & O. R. R. }
Baltimore, Sept. 30, 1831. *}*

TO JONATHAN KNIGHT,
Chief Engineer.

MY appointment to the office of Superintendent of Construction (which took place on the first of April) renders it proper that I should report at this time the progress of the work committed to my charge.

This report from the nature of the several duties connected with the office, will embrace the work under three different heads, to wit: The laying of the rails generally—the repairs of the road and railway—and the erection of the required buildings and fixtures at the several depots, and to the latter may be added the introduction of the railway into the improved part of the city of Baltimore, which has been conducted under my immediate supervision.

For the required information concerning the laying of the rails beyond the limits of the city of Baltimore and other matter connected with its details, I refer to the report of James P. Stabler, to whom has been committed the personal superintendence of that part of the work, a copy of which is herewith furnished and marked AA.

The railway in the city and first division of the road, has undergone a thorough examination, and such repairs as appeared necessary have been made. The embankments at the several high fillings have been strengthened by the application of the redundant earth from the cuttings, and several of the embankments have been thatched with brush to prevent further abrasion.

A small experiment has been made by driving piles to secure a part of the bank from slipping into the deep cut on the first division, which it is believed will also hereafter secure it against the action of frost or rains.

A stone building has been commenced at Ellicotts' Mills, for the reception of produce, and which also includes a car house and office, and is expected to be finished by the first of November.

A brick building has been erected at the depot near the intersection of Pratt street and the Washington road, for the deposit and safe keeping of cars, a weighing apparatus and office, to which is attached a small dwelling, has also been built there.

Sidings and turn-outs have likewise been constructed at that place, and a well has been sunk for the accommodation of steam engines and for the use of the depot.

That part of Pratt street east of the depot, to the intersection of Cove street, has been graduated and paved, and a track of stone rails is laid from the depot to a point on Light street near the basin, at which place a brick building is being erected for the accommodation of the company. This line is now being extended from the depot to the City Block.

In order to complete the buildings on hand, and for the erection of such others as may be contemplated at Frederick and elsewhere, together with other improvements which it may be found expedient and necessary to construct, it is believed a sum not less than twenty-five thousand dollars will be required.

Respectfully submitted,

JACOB SMALL,

Superintendent of Construction B. & O. R. R.

[A.A.]

Office of Construction B. & O. R. R. }
Baltimore, Sept. 30, 1830. }

TO JACOB SMALL,
Superintendent, &c.

THE duty of personally superintending the laying of the rails on the Baltimore and Ohio rail road, having been confided to me by the Chief Engineer, until the time of thy appointment as Superintendent of Construction on the first of April last; and having been continued to the service, with orders to report to thee on all subjects connected with this duty, I herewith report the progress and present state of the work so far as I have been concerned in conducting its operations.

The first, and part of the second track of wood rails, having been completed from this city to Ellicotts' Mills, it had been determined that the remainder of the second track, about six miles in length, should be laid with stone and iron. This work was in progress on the first of October last, together with a single line of similar track from Ellicotts' Mills to the Forks of Patapsco, a distance of about twelve miles further. Since that time, a contract was entered into, for the completion of a single track on the third division, and also for constructing the second track on the second division, with stone sills.

It was confidently expected that the stone track on the first division would have been finished during the last year, but as no one engaged in its construction had any experience in that particular kind of work, it was impossible to form any certain estimate of the length of time that would be required for its faithful execution. From this cause, expectations which may have been based partly upon the facility and expedition with which the wood rails had been laid, were not realized; and in consequence of the unusual severity of the last winter, this track was not entirely finished until the opening of the spring. The same causes which operated to delay the completion of the stone track on the first division, contributed in a greater degree, to retard the work on the first track of the second division, to which were superadded, several that did not exist in relation to the other. This delay rendered it impracticable to complete the second track on this division as soon as had been anticipated.

These causes were, generally, the limited number of quarries that were accessible—the small number of hands that could be placed in any one of the quarries at one time—the scarcity at several periods during the progress of the work, of mechanics that could have been advantageously employed—the failure of several quarries which had been relied on, the stone of which having proved deficient both in quantity and quality,—the *time* as well as *expense* of transporting the sills considerable distances in common wagons, being much greater than was expected, especially during the latter part of the fall and winter, when the weather proved very unfavorable for many weeks together. These causes, all of which more or less influenced the operations of the contractors, and rendered the progress of laying the stone rails more tedious than was expected.

The second track on the second division is now in active progress of construction, and will cost rather more for the workmanship, than the first track. There remains to be done but $1\frac{1}{2}$ miles to complete the two tracks on this division, and the progress of the contractors during the current month, warrant the expectation of its being finished by the first day of November: both tracks are exclusively of stone and iron, except a small portion of wood, which is laid on some of the high embankments.

The preparation of the materials for the first track on the third division, commenced in November last and was prosecuted during the winter; the quarrying and dressing the sills, and the preparation of broken stone for bedding them, was continued until the graduation was sufficiently advanced for the contractor to commence laying down the track, which took place about the 2d of May last. Apprehensions began to be entertained in the early part of June that the contractor on this division was inefficient, and that the work would not be completed in due season. A proposition was therefore made to him to relinquish a part of his contract, which was acceded to, and an arrangement was soon in progress to place other contractors upon the part so relinquished.

About the 20th of June, however, it became apparent that he could not possibly complete the residue of the work in due season, and he was accordingly dismissed from the contract. The causes which led to, and the circumstances attending his dismissal, together with the events which followed, have been recited to the Board of Directors, in a communication from this department, dated 31st July last, a copy of which, with its accompanying documents, are herewith furnished and referred to, and are marked Nos. 1, 2, and 3.

The work from which Truxton Lyon had been dismissed, was immediately contracted for by John Littlejohn, Jr. and Co. embracing a distance of about 7 miles, nearly 6 of which were design

ed to be laid with stone, and the embankments, comprising the residue of that distance, with wood. This work has since then been prosecuted without delay, and it is believed will be completed by the 1st day of November.

The disappointment occasioned by the deficiency in the quantity of sills, reported to have been prepared by the former contractor, and which will be found to have been explained in the document just referred to, marked No. 1, rendered it expedient, in order to complete a single track on this division during the present season, to lay a greater extent of wood track than had been contemplated. Of the latter material, it was originally intended to lay about two miles, on the embankments included within these seven miles, leaving five miles to be laid with stone. No quarries, suitable for sills, were however, found upon this part of the division, and a portion of the sills for these five miles, had they been quarried, must have been transported on common wagons about nine miles. The saving of time and expense, was therefore deemed a sufficient reason under the then existing circumstances, to adopt the use of wood, and accordingly contracts were made for the requisite materials, and also for the workmanship, all of which is in a forward state. About $5\frac{65}{100}$ miles of this portion of the track are completed at the present time, and it is believed, from the supply of materials already on hand, and the general progress of the workmanship, that it will also be seasonably accomplished. There now remains of this division, below the foot of the first inclined plane, only $1\frac{27}{100}$ miles of stone and $2\frac{1}{100}$ miles of wood track to be finished to complete the first track.

At the opening of the second track on the second division, there will also have been completed in connection therewith, about one and a half miles of second track on the eastern end of the third division, by which the double track will be extended twenty six and a half miles from the city of Baltimore.

In pursuance of the views laid before the Board of Directors, in the last Annual Report from the Engineer department, contracts were made for a supply of materials, for the construction of a single track of wood on the fourth and fifth divisions, and on the lateral road to Frederick, and also for the western end of the third division included by the inclined planes, and for several miles of the second track across Parr Spring ridge.

This timber was in preparation during the last winter and spring, and from the late returns of the Assistant having in charge that part of the work, every confidence is now entertained that the supply will be sufficient to enable the company to open the road to Frederick by the first of December next.

About the middle of June, contracts were made with Joseph M. Kasson and William Otis for the workmanship on this portion

of the wood track, at the rate of two dollars per rod, and it has been prosecuted with much energy since that time. There has been laid by these contractors, on the western end of the third division, $2.\frac{72}{100}$ miles, leaving but $2.\frac{30}{100}$ miles to be laid on this part of the division.

From the known efficiency of the contractors who are now engaged on the work westward of Parr Spring ridge—from the supply of timber already on hand, and in preparation—and from the general progress of construction exhibited on the road and railway, no doubt is now entertained that the expectations of the board will be realized, by the completion of a double track of rails from Baltimore to the forks of Patapsco, and of a single track, thence to the city of Frederick, and to the Point of Rocks, during the year 1831, as contemplated in the last annual report.

The entire line of horsepath on the parts between Ellicotts' Mills and Frederick, and also between the Monocacy and the Point of Rocks, is under contract, at prices varying from fifty cents to eighty seven and a half cents per rod, or from one hundred and sixty, to two hundred and eighty dollars per mile for single track, according to the proximity of suitable materials, and the facilities afforded by other circumstances for the construction. These several portions of horsepath include the second track on the second division, and also the remainder of the track intended to be laid this year westward of the forks of Patapsco—they are, by contract, to be completed as the track of railway progresses, so that both the railway and horsepath shall be finished at nearly the same time.

The requisite quantity of spikes and plates, for the work, now on hand, have been ordered, and are furnished as they are wanted.

About two thousand five hundred tons of Iron have been received, and the remainder due, viz. one hundred tons, is expected to arrive in season.

John D. Steele, Jr. has been continued resident engineer of the second division, assisted by George Holtzbecker and John H. Wilson. Joseph Shriver, resident engineer of the third division, has been assisted by Robert G. Bowie, Joseph B. Conard, Hopewell Dorsey and Jonathan Price. Roger Howorth, and Isaac Briggs, have jointly in charge the requisite examinations of the graduation previous to laying down the rails, and giving the levels and curvatures for the workmen, on the part of the third, the fourth, and fifth divisions and the lateral road, and are assisted by Samuel Brooke, Charles Pollock, George Matthews, and George F. De la Roche. The immediate superintendence of the construction of the railway and horsepath on the fourth and fifth divisions and lateral road is confided to Caleb Stabler;

and the procurement and distribution of the wood materials to Otho H. W. Stull. The services of the several Engineers and Assistants, have been rendered with a zeal and assiduity highly creditable to themselves and to the work.

It remains now to form an approximate estimate of the funds which may be required by the Department of Construction for the work under contract, and for the operations of the ensuing year, in order to complete the railway to the Potomac river, with two tracks, and for one track on the lateral road to Frederick. From the construction of the several portions of railway already finished and in progress, the data is acquired for ascertaining, nearly, the cost of the railway. The present estimate will include the entire cost, except the fixtures at the inclined planes, the buildings at the several Depots—and the extension of the road into the city of Baltimore.

ESTIMATE.

Actual cost of wood rails laid on the City and First divisions of the rail road, under the contracts of March, April and June, as reported in October, 1830,	\$82,739.
Approximate cost of $1\frac{42}{100}$ miles laid on the City division in the autumn of 1829, at \$6,000 per mile, say,	8,520.
Add for expense of alteration to suit the flanges on the inside,	1,200.
Estimated cost of stone rails on the first division, say $6\frac{1}{2}$ miles at \$6,000 per mile,	39,000.
Ditto for first track of ditto, 2d division, 12 miles, at \$6.300 per mile,	75,600.
Ditto for second track of ditto on ditto, 12 miles, at \$6.500 per mile,	78,000.
Estimated cost of laying 10 miles of track on the 3d division, at \$7,500 per mile,	75,000.
Ditto the residue of the two tracks on the 3d division, say 25 miles, at \$5,000 per mile,	125,000.
Ditto two tracks, say 28 miles of single track, on the 4th division, at \$5,000 per mile,	140,000.
Ditto 22 miles ditto on 5th division, at \$5,000 per mile,	110,000.
Ditto $3\frac{1}{2}$ miles single track on lateral road, at ditto,	17,500.
Add for contingencies, including the pay of engineers, &c. say 7 per cent,	52,679.
Total required,	<u>\$805,238.</u>

Deduct for payments made on account of the above work:

City and first divisions for railway,	\$118,206.	
Second division for ditto,	89,598.	
Third division for ditto,	33,765.	
City 1st, 2d and 3d divisions for horsepath,	6,089.	
Paid for pine scantling,	10,000.	
Rail laying account for 4th and 5th divisions,	17,900.	
Timber account for ditto,	20,250.	
Ditto for 3d division,	2,950.	
Culverts on 1st and 2d divisions,	552.	
Repairs of road and railway during the time of constructing the track, widening road bed, quarrying off points of rock, and extra work at laying rails,	4,200.	
Other contingencies connected with laying the rails, hauling materials, &c.	13,450.	
Paid for iron in Liverpool,	75,060.	
Ditto for freight, &c. in Baltimore,	6,464.	
	<hr/>	
	81,524.	
Less the cost of iron used on the City and First divisions,	19,576.	61,948.
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Paid for rail road spikes,	5,543.	
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Total expended,	\$384,451.	384,451.
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Leaving this sum, viz. =	\$420,787.	
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to be disbursed, to complete the entire line from Baltimore to the Potomac river and to Frederick.

In order more fully to shew the progress of the work since the last Annual Report, as also its present situation, I have prepared the following

TABULAR STATEMENTS.

Shewing the length of single and double tracks of railway actually laid on each section of the several divisions,—and the length yet to be laid of single track,—The extent laid, and to be laid on each division,—together with the aggregates of the several divisions, inclusive of the lateral road to Frederick:

[No. 1.]

CITY AND FIRST DIVISIONS.

Aggregate length of the 2 Divisions.	Length of stone track laid, inclu- ding both tracks.		Length of wood track laid, inclu- ding both tracks.		Cost of rails on the two divisions.
	Miles.	6.05	Miles.	19.95	
13	Miles.		Miles.		Dollars.
					131.459

10 miles of the wood rails, were laid in one month or 4 weeks— $5\frac{39}{100}$ miles in 6 weeks—and $2\frac{94}{100}$ in 6 weeks: the difference in the time occupied being occasioned by variations in the number of workmen employed.

The 6 miles of stone track were laid in about $6\frac{1}{2}$ months.

SECOND DIVISION.

FIRST TRACK.				SECOND TRACK.			
Sections.	Length of sections.	Stone track laid.	Wood track laid.	Stone track laid.	Stone track to be laid.	Wood track laid.	Wood track to be laid.
No.	Poles.	Poles.	Poles.	Poles.	Poles.	Poles.	Poles.
1	128.88	128.88		128.88			
2	139.64	139.64		139.64			
3	151.20	151.20		71.20	80.00		
4	151.92	151.92		151.92			
5	133.52	133.52		133.52			
6	115.12	115.12		115.12			
7	200.29	200.29		200.29			
8	138.02	138.02		138.02			
9	169.73	169.73		169.73			
10	163.68	163.68		154.18		9.50	
11	185.35	185.35		185.35			
12	60.80	60.80		60.80			
13	153.01	94.24	58.77	94.24			58.77
14	157.24	157.24		139.06		18.18	
15	190.48	190.48		190.48			
16	96.58	96.58		31.58	65.00		
17	171.60	171.60		36.60	135.00		
18	72.16	72.16		72.16			
19	160.96	160.96		85.15	60.36	15.45	
20	154.78	132.18	22.60	100.73	21.21	32.84	
21	157.16	157.16		157.16			
22	103.04	103.04		103.04			
23	133.22	114.58	18.64	122.53		10.69	
24	131.60	131.60		107.79		23.81	
25	173.66	146.82	26.84	141.55		32.11	
26	139.64	131.88	7.76	112.44		27.20	
Total in miles,		11.24	.42	9.59	1.35	.53	.18

The actual and estimated cost of this Division for the two tracks is \$153,600: its

length estimated at 12 miles.

4⁶/₁₀₀ miles of the stone track occupied in its construction about 8¹/₂ months.

4⁶/₁₀₀ do. do. 10 months.

12¹⁵/₁₀₀ do. do. 6 months } 9 months.

Preparation of materials for do.

[No 3.]
THIRD DIVISION.

Sections.	Length of sections.	STONE track laid.	STONE track to be laid.	WOOD track laid.	WOOD track to be laid.
No.	Rods.	Rods.	Rods.	Rods.	Rods.
1	80.	63.		17.	
2	142.	119.		23.	
3	183.	18.	93.	36.	36.
4	145.		125.		20.
5	127.		18.	30.	79.
6	88.	70.		18.	
7	139.	120.	19.		
8	107.	71.		36.	
9	178.	172.		6.	
10	84.	84.			
11	78.	59.		19.	
12	79.	79.			
13	91.	51.		40.	
14	60.	60.			
15	85.	45.		40.	
16	47.	47.			
17	60.	60.			
18	118.	112.		6.	
19	144.	114.	30.		
20	206.		126.		80.
21	121.				121.
22	119.				119.
23	145.			20.	125.
24	120.			86.	34.
25	73.			73.	
26	170.			170.	
27	321.			291.	30.
28	141.			141.	
29	145.			145.	
30	41.			41.	
31	145.			145.	
32	161.			161.	
33	236.34			236.34	
34	199.98			199.98	
5	303.			303.	
36	115.14				115.14
37	133.32			133.32	
38	236.88				236.88
39	133.38				133.38
40	131.68				131.68
41	121.20				121.20
Total in miles,		4.20	1.27	7.54	4.33

The actual and estimated cost of this division for the two tracks is \$200,000. And its length estimated at $17\frac{1}{2}$ miles.
 $4\frac{20}{100}$ miles of stone track has occupied in construction $2\frac{1}{2}$ months or ten weeks.
 $1\frac{97}{100}$ miles of wood track has been laid in 3 weeks.
 $4\frac{82}{100}$ do do 6 weeks.
 $2\frac{100}{100}$ do do 8 weeks.

[No. 4.]
FOURTH DIVISION.

Sections. No.	Length of sections. Poles.	Wood track laid. Poles.	Wood track to be laid. Poles.
1	230.28		230.28
2	199.19		199.19
3	222.76		222.76
4	254.52	88.	166.52
5	212.10	212.10	
6	254.32	254.32	
7	127.26	24.	103.26
8	163.62	24.	139.62
9	199.98		199.98
10	121.20		121.20
11	193.92	193.92	
12	151.50		151.50
13	193.92		193.92
14	139.38		139.38
15	90.90		90.90
16	139.92		193.92
17	266.64	146.36	120.28
18	145.44	145.44	
19	230.28	146.72	83.56
20	157.56	157.56	
21	157.56	157.56	
22	157.56	157.56	
23	115.14	115.14	
24	200.58	200.58	
25	78.78	78.78	
26	182.76	152.46	30.30
Total in miles,		7.04	7.45

The estimated cost of the double track of rails on this division is \$140,000. And its length estimated at 14 miles.
The track laid was commenced about the first of July, since which time the contractors have laid several miles additional on other parts of the road.



RECAPITULATION of Tabular Statements, showing the length of the several divisions, the length of single track of stone and wood, respectively, laid and to be laid, to complete the double track from Baltimore to the Forks of Patapasco, and the single track thence to Frederick and the Point of Rocks.

Divisions.	Length of divisions.	Designation of tracks.	Single track laid with STONE.	Single track to be laid with STONE.	Single track laid with WOOD.	Single track to be laid with WOOD.	Actual and estimated cost of each division for two tracks.	Actual and estimated cost of per mile on each division, for two tracks, exclusive of contingencies.
	Miles.		Miles.	Miles.	Miles.	Miles.	Dollars.	Dollars.
City and first, } Second } Third, } Fourth, } Fifth, }	13. 11.66 17.34 14.50 11.	First and Second, } First, } Second, } First, }	6.05 11.24 9.59 4.20		19.95 .42 .53 7.54 7.04 1.03		131.459 153.600 200.000 140.000 110.000	10.112 12.800 11.428 10.000 10.000
Lateral road	67.50 3.50				1.28	2.15	17.500	
Totals,	71		31.08	2.62	37.79	24.08	752.559 52.679	
Add for contingencies,								
							Dollars.	805.238

- Note 1. Total length of STONE track laid at this time, 31.08 miles.
Deduct for track laid prior to 1st October, 1830, 5.03
Total STONE track laid since the last Annual Report, 26.05 miles.
- Note 2. Total length of STONE track laid since last year, 26.05 miles.
Total length of WOOD laid at this time, 37.79
Deduct for WOOD laid on First division, *last year* 19.45
18.34
44.39
Add for stone laid in the City of Baltimore, 1.00
Total of single track laid since the last Annual Report, 45.39 miles.
- Note 3. Length of STONE track laid at this time, 31.08 miles.
Ditto WOOD, 37.79
Add track laid in the City of Baltimore, 1.00
Total length of single track now laid, 69.87 miles.
- Note 4. Length of stone track to be laid this year, 2.62
Ditto WOOD do. 24.08
Total, 26.70
Deduct for stone on second track, second division, 1.35
Ditto WOOD ditto .18
Ditto WOOD on 1st track, 5th division, 9.97
Total of single track to be laid to reach Frederick, 15.20 miles.
- Note 5. Total length of City, 1st, 2d, 3d, 4th, and 5th divisions, $67\frac{1}{2} \times 2 = 135$
Single track on lateral road to Frederick = $3\frac{1}{2}$
138 $\frac{1}{2}$ miles.
- Note 6. The aggregate cost of 138 $\frac{1}{2}$ miles of single track, \$805,238
- This sum divided by the entire length of single track, gives as an average cost for the single track \$5.814 per mile, or for the double track \$11,628 per mile, inclusive of contingencies.

[No. 5.]

FIFTH DIVISION.

Sections.		Wood track	
Length of sections.		laid.	
No.	Poles.	Poles.	Poles.
1	157.56		157.56
2	284.82		284.82
3	175.74		175.74
4	157.56		157.56
5	115.14		115.14
6	296.94		296.94
7	375.72		375.72
8	278.76		278.76
9	181.80		181.80
10	290.88		290.88
11	175.74		175.74
12	151.50		151.50
13	284.88		284.88
14	133.32	124.23	9.09
15	218.16	72.72	145.44
16	242.40	133.02	109.38
Total in miles,		1.03	9.97

The estimated cost of the double track on this division is \$110,000, and its length 11 miles.
About three weeks have been employed in laying the track now completed.

[No. 6.]

LATERAL ROAD.

Sections.		Wood track	
Length of sections.		laid.	
No.	Poles.	Poles.	Poles.
1	170.38		170.28
2	145.44		145.44
3	199.98		199.98
4	181.80	9.30	172.50
5	363.23	363.23	
Depot.	36.36	36.36	
Total in miles,		1.28	2.15

The estimated cost of the single track on this road is \$17,500, and its length estimated at 3½ miles.
About 2 weeks were occupied in constructing the track laid.

It will be perceived on an inspection of these tables:—

That the two tracks on the City and First Divisions of the road, or from Baltimore to Ellicotts Mills, are completed.

That the first track on the 2d division is also completed; and that there remains but about $1\frac{1}{2}$ miles of single track of stone and wood together to complete the double track on this division, from Ellicotts' Mills to the Forks of Patapsco.

That on the 3rd division, there has been laid up to the present time, $4.\frac{2}{100}$ miles of stone, and $7.\frac{54}{100}$ miles of wood, and that there remains to be laid $1.\frac{27}{100}$ miles of stone and $4.\frac{33}{100}$ miles of wood, to complete the single track.

That there has been laid on the 4th division $7.\frac{4}{100}$ miles of single track, leaving $7.\frac{45}{100}$ yet to be laid.

That on the lateral road there has been laid $1.\frac{28}{100}$ miles, (exclusive of a portion of 2d track at the depot at Frederick) and that on this road there remains to be laid $2.\frac{15}{100}$ miles.

That the entire length of single track yet to be laid from the forks of Patapsco to the city of Frederick, is $15.\frac{30}{100}$ miles, $13.\frac{93}{100}$ miles of which are to be laid with wood, and $1.\frac{27}{100}$ miles of stone. The iron rails, string pieces and sleepers for this portion of the road, (with the exception of a small quantity yet to be furnished for the lateral road) are delivered on the ground, and the contractors for laying the rails have expended labour in preparing broken stone and dressing the sleepers equivalent to the construction of 3 miles of the wood track. This will reduce the actual labour to be performed on the single track yet to be laid between Baltimore and Frederick, to an extent not exceeding $10.\frac{93}{100}$ miles of wood, and $1.\frac{27}{100}$ of stone track.

It will also be seen upon a comparison of the length of time heretofore occupied in laying the wood structure, with the length of track laid, that the time now allowed for the completion of the residue of the track to Frederick, is sufficient under ordinary circumstances to finish the work, especially, when it is known that on the first division, ten miles of the single track of wood were laid in one month, during which time, the greater part of the materials were *obtained*, and delivered on the graduated surface of the road.

It will also be seen that there has been laid on the 5th division extending from the Monocacy to the Point of Rocks, 1. 3-100 miles of single track, leaving 9. 97-100 miles to be laid. The preparation of materials by the contractors on this division, will by the same rule as applied to the 3d and 4th divisions and lateral road, reduce the work to be done on the 5th division, to an amount not exceeding what would be required in the construction of $8\frac{1}{2}$ to 9 miles of single track.

That the average cost per mile of the double track on the City and First divisions, inclusive of 6 miles of stone track, has been \$10,112 per mile.

That the average cost of the double track, per mile, on the 2nd division which is exclusively of stone, (except a small portion of wood on the embankments) will have been \$12,800.

That the average estimated cost per mile of the double track on the 3rd division, including not less than ten miles of single track of stone, will have been \$11,428; and that the probable cost of the double track on the 4th and 5th divisions will have been \$10,000 per mile, exclusive of contingencies.

From the foregoing statements and estimate which it is not doubted will cover all expenses, it results, that the two tracks as proposed to be laid from Baltimore to the Point of Rocks—a distance of $67\frac{1}{2}$ miles, and a single track on the lateral road to Frederick of $3\frac{1}{2}$ miles, or, $138\frac{1}{2}$ miles of single track, of which 40 miles are of stone, will have cost \$805,238, averaging \$5,814 per mile for single, or \$11,628 per mile for the double track, inclusive of contingencies.

That the entire length of stone track now laid, exclusive of about one mile within the city of Baltimore, is 31. 8-100 miles, from which deduct 5. 3-100 miles laid prior to the 1st of October, 1830, and there remains 26. 5-100 of single track of stone, which has been laid since the last Annual Report.

That there has also been laid of wood, during the same period 18. 34-100 miles of single track, making together 45. 39-100 miles:—all of the wood, with the exception of a very small portion having been done within the last ten or twelve weeks,—And, that there is *at this time*, about 70 miles of single track of railway laid on the Baltimore and Ohio Rail Road.—Embracing, it is believed, an extent of railway, greater than has been constructed on any one continuous line, either in this country or in Europe.

Respectfully,

JAMES P. STABLER,
Assistant Engineer

(No. 1.)

Office of Construction, B. & O. R. R. }
 Baltimore, July 31st, 1831. *}*

To the President and Directors of the Baltimore }
and Ohio Rail Road Company. }

IN pursuance of a resolution of your board, the Superintendent of Construction proceeds to lay before you "a full narration of the facts and circumstances, which led to, and have attended the late disorders upon the 3d Division of the road, in order that the board may ascertain the real cause thereof, and as far as possible provide against the recurrence of such disorders."

On the 8th of October 1830, a contract was entered into with Truxton Lyon to lay a track of "Stone and Iron" railway on the whole of the 3d Division, commencing at the forks of Patapsco. It would have been preferable, and was so considered at the time, to have divided the contract among several persons, instead of thus giving it to one individual; but the small number of quarries, their situation on one part of the division alone, and the difficulty of more than one contractor working profitably at them at the same time, seemed to render it a matter of necessity to place the stone work in the hands of a single contractor, who it was hoped, by working the quarries to the best advantage, and without interference would increase their productiveness, so as to make up for their limited number, and peculiar situation; otherwise the contract would certainly have been divided into several portions, and let to different contractors; when, if one had failed or absconded, his workmen would have found employ with the others,—the workmen of the others interested in the preservation of order, would have formed an efficient guard to the public peace and the safety of the road,—the work would not at all have been delayed, and the disastrous consequences would have been avoided, which followed the unexpected disbanding of unpaid workmen, irritated by want and misrepresentation, without employment to keep them from misconduct,—far surpassing in numbers, the neighbouring population, and who were finally goaded to acts of desperate violence, by the unquiet and lawless spirits among them. It is therefore frankly to be admitted, that had the contract given to Lyon been distributed among several persons, the recent disturbances might

possibly have been avoided; and for the future the necessity of subdividing the divisions into small and more convenient sections, has been made eminently apparent, and will be attended as a matter of primary importance. No anticipations however of what has happened, existed at the time of making the contract in question, and no reasons were then suggested that were sufficient to counterbalance the advantages which it was believed would result from the quarries being worked by one contractor alone.

Lyon came into the service with the highest recommendations both for activity and probity.—The work was given to him at a price which he considered fully adequate to enable him to perform it profitably to himself, and he commenced operations with an apparent zeal and efficiency that justified the expectation of a speedy completion of his contract. He continued to progress with due diligence during the winter of 1830-31, and without complaint against him on the part of the workmen or others until the spring of 1831, when reports discreditable to him reached the Superintendent.—These reports however had reference to his personal and moral conduct alone; and although injurious to him as an individual, constituted no reason why he should be held to account under his contract; especially as the monthly returns of the Resident Engineer, exhibited an increase in the quantity of work done by Lyon that still promised the completion of his contract within a reasonable time. Still later in the spring of 1831, various reports that were current gave reason for fear on the part of the Superintendent, that the interest of the company might require the dismissal of Lyon, and the employment of another contractor; and indeed at this time, all that prevented his dismissal, was the large amount of stone which the Resident Engineer reported him to have quarried,—almost enough to have completed the whole track which he had undertaken.

It appeared manifestly unjust to take the contract from him just as he had performed the hardest part of it—the preparation of materials,—and was on the point of realizing his expected profits: he was consequently, although reluctantly, still longer retained.

Things were in this situation, about the 20th of June, when most unexpectedly, information was received that the workmen of Lyon had struck, or ceased to work; that Lyon was in their debt to a considerable amount, and that they had threatened immediate destruction to the work unless they were paid, and that Lyon himself was absent from the Division. Mr.

Stabler to whom the superintendence of laying the rail had been more particularly confided, was on the spot at the time,—and having momentarily pacified the workmen by an assurance that he would report their situation to the Directors, and ascertain what could be done for them, he came immediately to Baltimore and confirmed the accounts that had been previously given. In the mean time a hasty examination of Lyon's account had been made, and it was ascertained that there would be due him, at the contract price, for the work as reported by the Resident Engineer, only between two and three thousand dollars. Mr. Latrobe one of the legal advisers of the Company was forthwith dispatched by the President, with instructions to effect an arrangement with the workmen, and with authority to promise that the balance due to Lyon, whatever it might be, and at least two thousand dollars, should be forfeited under his contract, and paid to them. Mr. Latrobe saw nearly the whole of the workmen, and represented to them that the Company had a right under the terms of Lyon's contract, to retain any balance not exceeding one fifth of the whole contract value of his work,—that in the hurried examination that had been made before he (Mr. Latrobe) had left Baltimore, it appeared that from two to three thousand dollars were due to Lyon, which being within the one fifth, would be forfeited and distributed among them,—that it might be more or less, but that at all events, the sum to be distributed would not be less than \$ 2,000. The men appeared satisfied with this, many remarking, it was all they could expect that the Company should give that gratuitously, which might have been legally retained as a penalty for the non-performance of the contract.

Mr. Latrobe now returned to Baltimore satisfied that the men perfectly understood, that the sum of two or three thousand dollars spoken of, was the whole sum due to Lyon under his contract, and was a part of the one fifth which the Company had a right to retain, and that they were willing to accept a dividend of it, and proceed to work as usual under another contractor.—On Mr. Latrobe's return, Lyon's contract was annulled with the advice of legal counsel, and the balance believed to be due, forfeited to the Company. On the 21st of June, Mr. Stabler proceeded to the 3d Division, and collected all the accounts, and ordered, and saw executed, an accurate estimate of the work.

It was now found that instead of being indebted to the men and boarding housekeepers about \$ 3,000 only, as had been repre-

sented by Lyon, his debts to these persons amounted to \$ 9,000 and that instead of having quarried 105,728 feet of stone sills, as reported by the Resident Engineer on the 11th of June 1831, Lyon had in fact only quarried 54,706 feet, or 51,022 feet less than he had been paid for; so that owing to this inexplicable mistake on the part of the Resident Engineer, the company instead of owing Lyon \$ 2,367 60 as would have been the case had the estimate been correct, had in fact overpaid him \$ 2,358.65, in the estimate thus made by Mr. Stabler, full justice was done to the contractor, and the Resident Engineer himself assented to its correctness.

It is not believed that there existed any collusion whatsoever between the contractor and the Resident Engineer. He was highly recommended to the company, stood well in their estimation, and had satisfactorily attended to the laying of the stone rails on the First division. But he certainly suffered himself to be deceived, or imposed upon in the most egregiously exceptionable manner. Had his reports been correctly made, Lyon would long before have been dismissed, since, as has already been stated, all that secured his continued employment was the large amount of work which it was believed he had performed. The facts thus ascertained were laid before the board of Directors on the 28th of June in a report from this Office which is here referred to as a document, and the board passed a resolution directing the Superintendent to distribute the sum of \$ 2,014 45 among Lyon's workmen: this sum being produced by estimating the work already done by him at \$ 14 00 per rod, the highest value that could be put upon it; instead of the contract price \$ 10 50. The board of Directors assented to this course, as was understood, chiefly for the purpose of keeping their faith with the workmen, and preventing them from suffering on account of the error committed by the Resident Engineer, who was the agent of the company. On the same day Mr. Stabler, together with Mr. Shriver, the newly appointed Resident Engineer, started for Sykes' on the 3d Division, and on Wednesday the 29th offered to pay to the men who collected there, their respective dividends of the above sum, amounting to twenty cents in the dollar.

The men however after the departure of Mr. Latrobe, and within the last few days had been led to believe by Lyon, who had now returned to the neighbourhood, that the company were indebted to the contractor to the amount of at least \$ 9,000, and with the exception of two men who received their dividends,

they refused to accept any thing less than the whole amount due to them from Lyon.

To their demand of full payment Mr. Stabler could only answer that he came there for a specific purpose, to distribute a certain sum, and if they declined taking it, he must return to Baltimore for further orders. Seeing that nothing could be obtained from Mr. Stabler the workmen marched directly to the road, armed with their usual tools, and commenced destroying the sills, and tearing up the culverts in the neighbourhood of Sykes'. After a short time however, they were induced to cease, and agreed to wait until ten o'clock the next day,—in the hope that what they had already done, would bring the board to terms with them; determining if it failed, to continue to commit acts of violence until they succeeded in obtaining full payment. Mr. Stabler came express to Baltimore where he arrived at 2 o'clock on the 29th and calling at once upon the counsel of the company, a warrant was obtained from Judge Hanson, requiring the Sheriff to arrest the persons named in it, and all others whom he might find engaged in the riot. This was put in the Sheriff's hands at three o'clock, with directions that he should at once proceed to the spot, summoning as he went the "*Posse comitatus*" and endeavour to keep the peace and support the laws. The Sheriff reached the 3d Division on the next morning, Thursday, in company with Mr. Patterson the only person of the *Posse* who attended to his summons at that time. They had not proceeded far down the road when they were met by the workmen to the number of 135 marching with their stone hammers, and other tools, with a handkerchief on a pole for a flag, under the command of one of their number, named Hugh Reily, to whom they appeared to pay implicit obedience. One of them seized the reins of the Sheriff's horse and refused to let him proceed, and *all* were totally regardless of his authority, and injunctions. Finding that he was powerless to protect the laws, he returned to Sykes' and dispatched an express to Baltimore, stating the inefficiency of the civil authority without the assistance of a strong armed force.

The conjuncture had now arrived, when for the first time it became legal to call for military aid, and within an hour after the express reached town, Judge Brice had granted the necessary warrant to Brigadier General Steuart, and by ten o'clock on Thursday night, upwards of 100 of the volunteer troops of this city, fully equipped and officered were despatched in cars to the aid of the Sheriff. They reached the 3d Division, soon after

daylight,—found the rioters wholly unprepared,—made prisoners of near fifty of them, among whom was Reily, left a company at Sykes' to secure order, and returned to Baltimore on the afternoon of Friday; having successfully accomplished the object of their expedition, without contest of any kind, or the slightest accident.

A Company remained at Sykes', and returned on Saturday with 18 prisoners more,—reported the riot to be entirely quelled, and the rioters who were not taken, entirely dispersed.

The contractor to whom the work had been re-let, was now enabled to proceed with his work, and is at this time efficiently engaged in prosecuting it.

The damage that was done to the road, consisted in defacing the stone sills both on the road and in the quarries, so as to render them useless unless redressed, and in wholly destroying some of them.—In some places where the Iron had been laid, it was torn off,—several culverts of small dimensions were injured at their ends, and nearly all the timber collected for laying the track of road, on the embankments of the first six miles was burnt or otherwise destroyed.

Upon accurate estimate it is found that the pecuniary damage which the company have sustained, amounts to \$6,074 $\frac{6}{100}$ and the loss of time occasioned by the riot may be estimated at from five to six weeks. The superintendent here refers to paper marked No. 2, explanatory of the estimates and data upon which the foregoing statements have been made.

The cause of the disturbances herein detailed, and which the Board inquires into, may in the opinion of the superintendent be referred almost wholly to the errors committed by the Resident Engineer. His estimates appear to have been erroneous from the period of his taking charge of the Division, and in the proportion generally of two to one in favour of the contractor.—Had they been correct, there can be no doubt that Lyon would have been dismissed almost immediately on the commencement of the Spring operations, since it would then have been apparent, that the price at which he undertook to lay the rails was insufficient, and that he was incompetent to comply with the terms of his contract. He would have been dismissed too, at a time when he had but few hands in his employ, and when he owed them comparatively but little. As it was, however, the exaggerated estimate of the Resident Engineer, caused Lyon to be retained until he became so involved in debt and difficulty that extrication was impossible.

For the mode in which the Superintendent, proposes to pre-

vent the recurrence of similar disorders, the Board is referred to the communication of the chief Engineer of the 6th of July marked No. 3. The views of the chief Engineer have been adopted, and are now in successful operation, so far as they are applicable to the portions of work under contract.

Respectfully submitted

JACOB SMALL,
Supt. of Const.

(No. 2.)

ESTIMATE of the pecuniary damages sustained by the Baltimore and Ohio Rail Road Company in consequence of the late riot on the 3d Division, by

J. P. STABLER, *Asst. Engr.*

August 25, 1831.

Entire length of sills mutilated by Lyon's workmen, including those in the quarries, delivered on the road, and laid in the track	Feet run	25,634
Deduct for loss in measurement in re-dressing		3,535
		<u>22,099</u>

Entire available length of mutilated sills re-faced, by contract 22,099 feet at $12\frac{1}{2}$ cents per foot	\$ 2,762 37 $\frac{1}{2}$
--	---------------------------

Loss in measurement of Lyons' mutilated sills, replaced by Littlejohn at \$ 14 per rod of track; viz. 3,535 feet at the following Tariff of Prices.
viz :

Quarring	10	cts, per foot,
Dressing	9	do. do.
Delivery	$7\frac{3}{4}$	do. do.

3535 feet at $26\frac{3}{4}$ cents per foot,	945 60
--	--------

Length of sills laid in Lyon's track 11,900 feet run, relaid by Littlejohn at \$ $13\frac{1}{2}$ per rod,	
Tariff price for laying $7\frac{1}{4}$ cents per foot run	862 75

700 feet of sills estimated to Lyon as being ironed. The work done by Littlejohn at 4 cents per foot,	28 00
8 days labour of masons repairing culverts at \$1 50 per day	12 00
Gathering up Iron misplaced by Lyon's workmen and straightening ditto by Cornelius,	17 75
Loss of iron by being broken and bent, and for iron not yet found, say 50 bars at \$3 per bar	150 00
Loss of 409 lbs. of nails, delivered, at 14 cents per lb.	44 99
Additional quantity of broken stone required to re-lay the track done by Lyon, 250 perches at \$1 per perch,	250 00
Re-delivery of 150 feet of sills thrown over the Banks—at $7\frac{1}{4}$ cents per foot	10 87 $\frac{1}{2}$
5000 feet running measure of scantling, burned and otherwise injured; to be replaced by contract	450 00
250 Sleepers burned, replaced at 25 cents each,	62 50
Dressing of 106 Sleepers to replace that number among those burned,—at 10 cents each.	10 60
492 feet of wood strings to be relaid in the sleepers at \$2 50 per foot	12 30
Vanebearers, axemen, and superintendence of the 11,900 feet of sills re-laid,	210 00
Expenses of Agents employed in the examinations and measurements of the mutilated work, including cost of implements, Tapes, Scales, marking apparatus, and compensation for their personal services, &c. &c. &c.	244 86
	<hr/>
	\$ 6,074 60
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NOTE—The above amount does not include the wages of the salaried officers and Engineers, in the Dept. of Construction, whose personal services were given for some time in tracing the levels and curves for laying the track done by Lyon; and subsequently to re-laying the same track by Littlejohn. Some of the *amounts*, in price and quantity both of materials and work, in the foregoing estimate, must of necessity be considered in some degree hypothetical, as the repairs are not at this time fully, though very nearly completed. The true aggregate it is believed will not vary from the above estimate 50 dollars more or less.

[No. 3.]

Engineers Office, B. & O. R. R.,
Baltimore, July 5, 1831. }

TO JACOB SMALL, ESQUIRE,
Superintendent, &c.

The recent occurrences connected with the operations in the Department for the laying of the railway upon the 3d Division, have been such, as in the opinion of the President, to call for a review of the rules and orders of proceeding, especially as they may relate to the actual superintendence of the work, and I have been directed by him to review the subject accordingly.

It is only in practice that the defects of a system become manifest, and whether these shall be made to appear from errors committed by our agents through negligence, incapacity, or otherwise, or from the ignorance, inefficiency, or cupidity of contractors, or from the improvidence or evil propensities of workmen, or from any other cause, it becomes our duty to note the defects, investigate the causes, and as far as practicable, to provide against the possible recurrence of the evils.

It is apparent that most of the evils which have arisen upon that division of the road, whether suffered by the workmen, the company, or the public, have been mainly owing to the erroneous estimates and returns of the late assistant engineer. Even upon these returns of the quantity of work performed, it became apparent, beyond all doubt, that the work did not advance with sufficient speed, and that this would not be remedied by the contractor then upon the work. He was therefore dismissed. But if correct returns had been made, the dismissal would have taken place at a much earlier day, and the magnitude of the evils and inconveniences which have occurred, would have been greatly lessened, if indeed they had existed at all.

It is true that a good contractor would not get largely indebted to his labourers, but would pay them a due and proper proportion of the moneys which he from time to time received upon the estimates of the engineer; and if he discovered that he was unable from the inadequacy of the contract price, to pay the labourers, he would at once make known that circumstance to the officers of the company, who might apply a remedy, such as the case required.

In the present instance however, the contractor availed himself of erroneous estimates, which enabled him to draw more money than was properly and legally due to him by the tenor of his contract; whilst at the same time he had the address to quiet his labourers so as to become largely their debtor, without complaint from them until his dismissal. Here both the contractor and the men in his employ have acted improperly; he, in acting as has

been mentioned, and they, by suffering him to owe them too much. Correct returns from the agent would, however, have prevented the occurrence of these evils, at least to any serious extent.

We have then, finally, to look, first to caution in making the contracts, in order that good contractors shall if practicable, be selected, and that the price shall be adequate; and secondly, to a rigid superintendence, exact measurements, and careful estimates, of the work as it shall advance, as the best securities both to the labourers and to the company, and to all persons or parties concerned.

It is better in general to divide the work among many contractors, than to award it to one or to a few, especially if it will admit of advantageous divisions by reason of extent in length, or quantity of work, or the position of materials to be employed in the construction.

Hitherto it is confidently believed, that much care has been taken to employ contractors, who came well recommended, or who there were reasons to believe would comply with their engagements, nor has there been an intention on the part of the company to let the work under its value. Whenever the railway has been laid with wood, the prices proved to be adequate, and the contracts were completed in every instance, it is believed, without reletting. But from the difficulty of foreseeing in the absence of experience, what would be the actual cost of laying with stone sills, the cost of this method has been underrated, and in almost every instance the contracts for laying the railway in this manner have been taken too low.

The data furnished from the experience already had, will enable us now to estimate the laying of the railway according to this method, with considerable accuracy, in all its details—and regard must be had to these data in the forming of new contracts for similar work. It is believed that in contracting for the laying with stone sills, too much work has been included in one contract; this should be guarded against in future.

After the contracts shall have been entered into, the next business is to see that the contracts are complied with, and that the railway is properly constructed. For this purpose there must be as heretofore, a scientific engineer, whose residence shall be on each division, and whose business it shall be actually to superintend all the operations upon that division, or such part thereof as shall be committed to his superintendence; and to make and return estimates at stated intervals of time, of the work performed under each contract.—These estimates must be made and returned once every two weeks; and will consist of a clear statement of the quantity of each kind of work which shall have been performed under each contract during the two weeks immediately preceding, together with the price of each kind of work, the

amount of the same, and the total amount,—with his remarks as to the force employed, to wit: Stating the number of men, animals, and vehicles, and the wages which the contractor gives for each kind of service, and the cost of boarding and provender, so as that a probable estimate may be formed of the actual expenditures of the contractor, and so also, that the tariff of prices in the estimate may be compared with the actual cost to the contractor of each item or kind of work. The remarks accompanying the estimate will also contain notices of the manner, and degree of speed with which the work advances or appears likely to advance, in order that it may be seen whether there is a necessity for demanding of the contractor that he shall enlarge his effective force and proceed to carry on the work, or any part of it with more speed, and also whether the contractor refuses to comply with any order or demand made upon him by the resident engineer within the intent and meaning of the contract, and in general to state any other thing which may or may not be embraced in previous instructions, and not now enumerated, and which it may be useful to know in relation to the service.

It is believed that the estimates and returns heretofore made, have went nearly to the extent here pointed out—nevertheless they have been defective in *estimating* where *measurement* might have been made, and in not furnishing the data whereby the actual cost to the contractor, of each kind of work could be known.

Certainty should always be arrived at where it is attainable, that is to say, all parts of the work admitting of precise measurement, should be *measured*, instead of only being estimated. Herein lies the greatest error which has been committed on the work at any time. For instance, had the engineer upon the 3rd division actually measured the stone sills which had been quarried, instead of estimating them in confused masses as they were promiscuously thrown out at the quarries, it would not have been possible for him to have erred to any serious extent.

The resident engineer should measure and mark every stone sill or block which he estimates for.

The quantities subjected to actual measurement will be,

The available length of the stone sills as they came in their rough state from the quarry, at the same time taking care that their form and other dimensions are admissible.

The available length of surface dressed for the reception of the iron rail, observing that it is properly done.

The length of sills laid down for the railway in a firm, substantial, and proper manner, as required, but not drilled.

The same that have been drilled, and on which the iron rails have been properly laid and fastened.

The quantity of broken stone which shall have been used in the laying down of the sills.

The quantity of broken stone which shall have been prepared but not used.

The length of sill stone properly distributed on the bed of the road for laying, distinguishing the length of those which are dressed, from those which are undressed.

The results of the actual measurements of so much of each of the portions of the work as above described, as shall have been performed within the two weeks for which the estimate is made, shall be estimated for, and the amount shall constitute the estimate for those two weeks, upon which payments will be made, to an amount not to exceed four-fifths of the sum due.

The several prices for each kind of work, and which are to be used by the engineer in making the estimates, shall consist of a tariff of prices made out so as to approximate as nearly as practicable to what each will actually cost, but at the same time so proportionally increased or diminished as the case requires, as to amount in the whole to the contract price.

This tariff of prices shall be approved by the superintendent of construction, and then issued to the resident engineer for his government in making the estimates.

In the progress of the work it may be found that the cost of some items may have been rated too high, whilst others may have been rated too low; should this be found to be so, the correction will be made with the approbation of the superintendent of construction, but care will be taken that no change shall be made that will cause the whole amount of the work to be done, to differ from that of the contract price.

It has been usual to contract at a fixed price per rod in length of the track, and the foregoing observations are made on the supposition that the contracts will be in that way.

To enable the assistant engineer having charge of a division, to see that the railway shall be properly constructed, and that the measurements and estimates shall be correctly made, he must be allowed such assistants as shall be necessary. Amongst these assistants there will be one whose business it shall be to judge of, and measure the broken stone, and he shall constantly attend along the line where stone are being broken, to judge of their quality and dimensions, so that no mistake shall be suffered in these respects. He shall also measure the quantity of such as he approves, and which have been broken since the then last estimate, that is, within the two weeks then to be estimated for.

This agent shall see that every labourer engaged in procuring broken stone is correctly informed with regard to the requisite qualities and properties that will ensure his work to be accepted by the resident engineer under the contract.

There will also be an assistant whose duty it shall be to attend to the measurement of the sill stone at the quarries and upon the road, in order to see if each stone or block is of admissible dimensions according to the contract, and also to ascertain the precise available length of sill stone which shall have been quarried, dressed, prepared, or laid within the said two weeks.

By "available length" is meant, the length of the stone if the ends are dressed or squared off for laying, or the length which the stone will probably have, after it shall be dressed, making a due allowance for squaring the two ends. The assistant shall mark each and every stone intended for a sill stone which he shall have measured and approved, and he shall enter into his diary the length of each stone separately, so that at the end of every week or two weeks, he can know, by addition, how many feet of sills have been quarried, how many dressed, how many delivered on the road bed, how many laid, &c. within that time. —He will constantly attend upon the line, and at the quarries, and will see that no deceptions are employed, nor errors committed by any one. There will also be, as heretofore, an assistant superintendent for each and every company or party of labourers that shall be engaged in laying down the stone sills in the formation of the railway, to see that the work is properly executed according to the rules and instructions which shall have been furnished him for his government therein. As the resident engineer for the division will be held responsible for the accuracy of all the measurements, and in general for the faithful execution of the contracts in all respects; it will be incumbent upon him to be constantly upon the alert to prevent the occurrence of errors, or the practising of impositions of any kind, by any person or persons whomsoever. He will therefore see amongst other things, that the measuring rules, tapes, and gauges, are all accurate, and that the same shall be correctly used at all times.

In addition to the several rules and directions here given and alluded to, the engineers and assistants will be governed also by those which have heretofore been given, and which are not superseded by these.

Contractors will be distinctly informed that any injustice practised upon their labourers will be considered a sufficient cause for their dismissal, and that this will be exercised to the letter.

The labourers will also be informed by the resident engineer, that it is the desire of the company that they shall demand their wages of the contractor at every pay day, and that it is expected upon a refusal or neglect of the contractor to pay them upon such demand, they will enter complaint to the resident engineer, whose duty it shall be to investigate the case immediately, and to make report thereof to the proper department without delay, unless the contractor shall promptly satisfy the demand of such labourer.

In all cases where part of the track shall be laid with wood upon sections or districts where the remaining part shall be laid with stone sills, the assistant who measures the sills and part to be laid with sills, will also measure and count the wood; and the parts to be laid with wood.

It is believed that the system heretofore adopted and pursued in relation to the superintendence of the contracts to lay the railway with wood instead of stone sills, has been found to answer the ends intended, nevertheless, it is desired that so far as the foregoing observations and orders, or the purpose and spirit of them may be applicable, so as to make good government, direct responsibility, and faithful service, more sure, the same may likewise be extended to embrace the mode of laying with wood, as in thy discretion it shall appear to be proper and necessary.

Should it now, or at any time appear to thee to be necessary to give new or additional instructions to the resident engineer, or to provide for any emergency or contingency that may arise in the course of the work claiming attention, or a remedy, thee will act upon the subject without loss of time, as to thee it shall appear necessary.

In making this communication, I deem it due to the service to state distinctly, that the only misconduct which has occurred on the part of the officers of the company, appears to have been committed by the late assistant engineer, in returning erroneous estimates as has been before mentioned.

Very respectfully.

(Signed,)

J. KNIGHT.

Chief Engineer.

(B.)

Location across Parr Ridge.

*Engineers Office, B. & O. R. R. }
Baltimore, June 6, 1831. }*

TO PHILIP E. THOMAS,
Pres. &c.

In accordance with thy instructions I have completed the final location and staking out for contract of the entire residue of the route of the Baltimore and Ohio Rail Road between the City of Baltimore and the "Point of Rocks" comprising a distance of about twelve miles, to wit: about three miles from the summit of Parr's ridge, eastward, and about nine miles from the same summit, westward; and connecting the 35th section of the 3d

division, the graduation and masonry of which has already been contracted for, with the 17th section of the 4th division, on which similar contracts have also been made.

The 3d and 4th divisions connect on the summit of Parrs Ridge. The part now reported as having been recently located, and which composes the western portion of the 3d division, has been divided into six sections numbered 36, 37, &c. to 41 : And the part west of the same and forming the eastern portion of the 4th division, has been divided into sixteen sections, numbered from 1 to 16 inclusive, in accordance with which arrangement the section stakes have been set up and marked.

Copies of the field notes comprising the survey and levels, and curvatures, and the references, together with the slopes of excavations and of embankments, and the breadth of road in the former and upon the latter, also the resulting quantities of excavation and embankment for each station and section, with the remarks and memoranda necessary to enable the Superintendent of graduation and masonry to execute the work in accordance with the location, in case it shall be approved of by the Board, have been forwarded by me to that officer under date of the 27th ult. duplicates of which accompany this report and are marked A. and B.

In consequence of the advertisement for proposals having been published, I deemed it necessary to place these documents in the hands of Caspar W. Wever, Supt. of graduation and masonry, previous to their being sanctioned by the Board, inasmuch as, without them, he could not have received the proposals from bidders, in a satisfactory manner.

The following tables contain a summary of the number and length of each section, with the respective quantity in cubic yards of the excavation and embankment.

EAST OF PARR'S RIDGE.

No. of Section.	Length in feet.	Excavation cubic yards.	Embankment cubic yards.
36	1900	2817.05	6809.35
37	2200	3858.37	7617.13
38	3909	24345.79	26963.14
39	2201	11191.15	18465.19
40	2173	9323.35	10645.61
41	2000	7390.31	8896.70

WEST OF PARR'S RIDGE.

No. of Section.	Length in feet.	Excavation cubic yards.	Embankment cubic yards.
1	3800	22151.15	20971.25
2	3287	8829.87	7544.95
3	3676	13480.20	16968.45
4	4200	9551.68	11461.91
5	3500	7071.10	6028.14
6	4200	5734.32	4334.03
7	2100	14547.33	14380.04
8	2700	7257.52	7342.23
9	3300	11785.28	12184.20
10	2000	7746.05	7659.94
11	3200	11519.66	10691.05
12	2500	19041.88	16653.36
13	3200	13303.54	14553.78
14	2300	7856.77	9128.52
15	1500	7052.09	9902.23
16	3200	15499.91	14670.31

Inasmuch as the Supt. of graduation and masonry, in pursuance of the regulations, will, in the course of a few days, make his report to the Board of the proposals for the graduation of the several sections, &c. with his remarks upon the same, it may be unnecessary for me, on this occasion, to say any thing in regard to the probable expense.

In relation to the curvatures, it may be said, that they are much more moderate than on the 1st, 2nd, and 3rd divisions.

With the exception of a short distance near the foot of each inclined plane, where the curvature is about 480 feet radius, there is none on the part now reported west of Parr's Ridge of less radius than 600 feet, and only a few hundred feet which has a less radius than 7 to 8 hundred feet.

It is the same on the part east of the ridge with the exception of the approach to the foot of the first inclined plane, where the radius of curvature is 400 feet for a very short distance.

Attention has been paid as far as practicable to avoid extremes of curvature, and also to prevent the extension of the higher grades through the greater curvatures inasmuch as a degree of curvature causes the same opposing effect to the moving power as a certain assignable quantity of ascent, even with the best constructed cars, though the retarding effect will be much greater with one kind of car than with another. The Winans car is preferable in this respect.

With regard to the grades, four inclined planes have been established, numbered from east to west 1, 2, 3, and 4. No. 1 and 2, are upon the east side, and 3 and 4 on the west side of Parrs Ridge.

These four inclined planes have a united length of 10,250 feet, or nearly two miles, and the levels between and attached to them amount to a distance of 8561 feet, or more than $1\frac{1}{2}$ miles; so that this system of planes and exact levels embraces a length of road equal to 18,811 feet or about $3\frac{1}{2}$ miles, one half of which is on each side of the apex of the ridge. But the whole height overcome by the planes is different on the two sides of the ridge; that upon the eastern side being $179\frac{98}{1000}$ feet, and that on the western side being $240\frac{98}{1000}$ feet.

The length of the shortest plane is 1900 feet, that of the longest is 3200 feet. The steepest grade is that of 1 in 20 or about 2 degrees and 57; the one of least steepness rises 1 in 30, or 1 degree 55.

The following description will give a more exact idea of these planes and the respective levels between and attached to them.

At the foot of plane No. 1 there is a level 300 feet in length straight with the plane.

Plane No. 1. Length 2150 feet, rise 1 in $26\frac{75}{1000}$, total rise $80\frac{375}{1000}$ feet—Then exactly level to foot of plane No. 2,—distance 3674 feet.

Plane No. 2. Length 3000 feet, rise 1 in $30\frac{12}{1000}$, total rise $99\frac{600}{1000}$ —Then exactly level on the summit of Parr's ridge to the head of plane No. 3—a distance of 600 feet.

Plane No 3. Length 3200 feet, descent 1 in $20\frac{5}{1000}$, total 159 630-1000—then exactly level to head of plane No. 4,—distance 3687 feet.

Plane No 4. Length 1900 feet, descent 1 in 23 35-100, total 81 350-1000—then 300 feet level and straight with the plane.

It was decided after mature examination that the most favourable place to cross the summit of the ridge presented at a distance of a few hundred yards southwardly of that of the crossing

of the same ridge by the turnpike road which leads from Baltimore to Frederick : —The route by this point being the most direct as well as the most suitable in all other respects. It is the same place for crossing the ridge that previous experimental surveys had indicated as the best with a view to the route down Bush creek.

The point of intersecting the summit with the two planes that should there meet from the two sides of the ridge, having been ascertained, my attention was then directed to the laying of the lines of the planes horizontally and vertically so as to fulfill, as far as practicable, all the beneficial conditions of which I was aware should attach to them, and to the operations of stationary power in general.

Amongst these conditions the following may be enumerated.

1. The plane to be straight in a horizontal direction.
2. To have both at the head and foot of the plane a portion of railway in length not less than 100 feet, but if practicable, 300 feet level, and straight with the plane.
3. That the level part at the foot of the plane should be susceptible of easy drainage to a depth of six feet below the level of the rails, as a contingent provision in case the machinery hereafter to be adopted should require it.
4. That the position of the head of the plane should be such that the localities would be as favourable as practicable to the erection and management of the stationary steam engine and its machinery and fixtures.
5. That the inclination of the plane from its head to its foot should be nearly uniform, but such as to allow of the greatest facility of movement to the trains of cars passing upon it.
6. That as far as consistent with other important conditions, the facilities of procuring a supply of water for the engine, should be attended to.
7. That the direction of the plane should as far as practicable coincide with the general or proper direction of the route of the Rail Road.
8. That the height to be overcome by the two planes which join at the summit of the ridge should be as great in each direction as the localities would permit without violating other essential conditions.
9. That if more than two planes (to wit, one on each side of the ridge and meeting at the summit) should be deemed necessary, the part or parts of the railway intervening between the planes should be level or very nearly so.

10. That every condition should be guarded against which it was believed might prevent the employment of the most approved machinery and fixtures.

11. That the foregoing objects should be secured in whole, or proximately, with the least expense in the construction.

It is confidently believed that in the location of the planes now reported, these essential particulars have been attained as far as practicable, if not very nearly to their full extent.

After the limits were known beyond which it became impracticable to extend the planes which are now numbered 2 and 3 and which joins to the summit, that is, after the points of lowest level and greatest horizontal distance from the summit that could be attained with each plane, was ascertained; the next subject of inquiry was what grade or grades should be continued in either direction from thence.

On the eastern side in addition to the plane (No. 2.) which surmounted the summit height, a plane had been introduced in the former experimental surveys of nearly a mile in length—the inclination of which was about 76 feet per mile, but so much curved that it would have been worked disadvantageously with stationary power, whilst the descent was not sufficient in any event to dispense with the employment of a tail rope.

The descent from the foot of the plane (No. 3.) on the western side was nearly similar, with this difference that the existence of a mill pond prevented the descent being much below the level of the foot of the plane for the distance of about a quarter of a mile, after which, for a distance of more than three-fourths of a mile, the descent was at the rate of about 90 feet per mile. The route here was also so much curved that stationary power could not be used with advantage upon it.

It was therefore considered to be indispensable that inclined planes No. 1, on the east side, and No. 4, on the west side, should be located upon principles which were believed to be essential to the advantageous and economical use of stationary power upon them.

After the system was extended so far as to include four inclined planes, it became necessary to consider whether or not it was proper that it should be extended yet farther, that is, whether the foot of inclined plane No. 1, from the east, and the foot of inclined plane No. 4, from the west, could be approached with animal or with locomotive steam power upon terms that would justify the limitation of the stationary power to these points.

It was found that in addition to ascents of about 35 feet per mile which had been heretofore established, it would require an

ascent at the rate of $37\frac{1}{2}$ feet per mile for the distance of about a mile to reach the foot of plane No. 1 from the east—and that in addition to ascents of 30 feet per mile, and a few hundred feet at 35 feet per mile, there would be required an ascent of $37\frac{1}{2}$ feet per mile for the distance of about two and three quarter miles to reach the foot of plane No. 4. from the west.

The curvature on these ascents of $37\frac{1}{2}$ feet per mile is nowhere at less radius than 1000 feet. There is a short distance of the ascent near the foot of the planes which rises at the rate of about 50 feet per mile. This is upon a straight part and was made to procure the level, at the foot of the planes.

The force to overcome the friction and gravity of a car the gross weight of which with its full load is 7,200 lbs. passing up ascents of 30, 35 and $37\frac{1}{2}$ feet per mile will be equivalent to a traction of 59, 66, and 69 lbs. respectively. That of two cars would be 118, 132, and 138 which are about the constant working effects of a medium horse. It follows that a horse of medium strength will easily, and for his constant work, draw two cars up either of these ascents, and the same horse for the short distance of these ascents, or a horse above the average strength will take up a train of three loaded cars at $2\frac{1}{2}$ to 3 miles per hour. Also, two horses will draw six cars which will probably be as many as it will be expedient to allow to compose a train on the inclined planes.

If planes No. 1 and 4 had been rejected and a uniform graduation substituted to be traversed with horse power, the ascent would have been about 80 feet per mile, or 1 in 66, and the friction and gravity of a loaded car passing up the ascent would be 127 lbs. and one car would be a load for one horse; consequently, in establishing the inclined planes No. 1 and 4 in lieu of a uniform graduation, the capacity of the Rail road is doubled, whether the moving power shall be that of animals, or of steam by locomotion.

I have therefore extended this system no further than I believed the capacity and usefulness of the rail road would require, and have forbore to extend it beyond the point of apparent necessity, from a conviction that this system of moving power will be found expensive, at least until the rail road shall reach the coal mines, when the expense of steam power upon it will probably be reduced one-half. Nevertheless the quantity of tonnage to pass the planes might be so great as to make this power relatively, as cheap as any other.

Whenever circumstances, founded on experience, shall justify it, either in point of expense, or to enlarge the capacity of

the railway, this system can be extended to any length desired. It may be extended on one ascending track up, on either side of the ridge, whilst the railway now made, and contemplated soon to be made, shall serve only for the trains descending eastward from plane No. 1, and westward from plane No. 4.

Respecting the quantity of power and the peculiar kind of machinery requisite to work these planes, I must observe, that I have not so fully matured the plans as to be able to report upon them at present. They are necessarily reserved for the subject of a future communication.

It is proper to say now, however, that these particulars have claimed my attention, and from necessity have, more or less, entered into my views in regard to the location of the planes. There is no insuperable difficulty attendant on the subject—it only requires care, and the exercise of a proper prudence and discrimination in adopting, from what has already been invented and put into successful practice elsewhere, such machinery and manner of working as shall suit the localities and at the same time be best adapted for a railway on which the traffic and conveyance of passengers will be in both directions, though in unequal and varying proportions at different times.

There is about the same tension on the ropes which work upon the planes of the Hudson and Delaware rail road as was contemplated to be on those to be employed on the Rain hill and Sutton planes, on the Liverpool and Manchester rail road, when stationary power was contemplated to be employed *there*—and about the same will take place on plane No. 3, (the steepest,) at Parr's Ridge when six cars with 15 tons of freight, being in all about 20 tons, compose the train. This train would be drawn up the plane at the rate of about 7 miles per hour (without any aid from the gravity of a descending train) by a steam engine of 60 horse power. The capacity of the plane would therefore appear to be sufficient to pass up 15 tons of goods in 5 minutes, (the length of the plane being nearly $\frac{2}{3}$ of a mile.) And allowing the same time for hitching to the rope, &c. as was admitted by all parties to be sufficient on the Liverpool and Manchester road, to wit, $2\frac{1}{2}$ minutes, the whole time will be $7\frac{1}{2}$ minutes, that is equivalent to 8 trains per hour. Allowing the freight in each direction to be as 1 west to 5 east in quantity of tonnage, therefore, for each train of 15 tons eastward, there will be 3 tons going westward; and if the plane shall be made to operate so as to pass the two trains at the same time, in order to economise the power by using the gravity of the descending to assist the ascending train, then a less pow-

er than that above mentioned would be employed, and 18 tons of freight might pass at each time, 8 times in an hour, or 144 tons per hour, or 1440 tons in 10 hours;—and if this be considered the day's work, then 449,280 tons of goods might pass in the year of 312 working days.

No doubt, therefore, can be entertained as to the capacity of plane No. 3, with the power mentioned. Planes No. 1, 2, and 4, will each require a power of about a 40 horse engine to pass an equal tonnage under the same circumstances. No. 4 is similarly circumstanced with No. 3 in this respect, to wit, that the greater tonnage will pass up it, and consequently the expenditure of power upon them will be much greater than upon No. 1 and 2, for upon these the greater tonnage will descend.

If the trade was to be uniform like the coal trade, no steam engines would be required upon these two planes, they might be what are denominated *self-acting* planes, in which the gravity of the descending train would be sufficient to propel the ascending one.

The trade upon the Baltimore and Ohio rail road will not be uniform, nevertheless, as the empty cars constitute $\frac{1}{2}$ of the whole tonnage and as the same number of cars must go in each direction; the gross tonnage in the two directions will be about as 1 to 2 or $2\frac{1}{2}$ and there may be a nearer approximation to regularity than would at first view appear to be probable;—a still nearer approximation may be made by suitable precautionary arrangements which may not be detrimental in other respects.

In this way, it is probable that the expenditure of steam power on planes No. 1, 2 may be much reduced below what would be otherwise be necessary.

This circumstance will also be considered in allotting the power to the several engines.

It may, perhaps, be proper at present to erect but one stationary engine on the summit sufficient to work plane No. 3 briskly, and cause the same engine also to work plane No. 2. Then so soon as it shall be found that the trade required another engine it could be erected. In the meantime something, as is always the case, would be gained from experience.

It may here be noticed that the level which connects the head of plane No. 1 with the foot of plane No. 2, crosses the turnpike road which leads from Baltimore to Frederick nearly at right angles with, and at about 14 feet above the level of it. A bridge will therefore be required to pass the turnpike and also a small stream at that place, under the rail road.

A crossing of the turnpike on a level with its surface would have been preferred, but it did not appear to be practicable, consistent with other important considerations.

The precise position of the stationary engines cannot be definitely located until the particular mode in which their power shall be transmitted to the trains shall be determined upon. For instance, if the ropes are made to wind and unwind upon drums, or if they are made to pass around sheeve wheels, these drums or sheeves may either be placed vertically over the road way, or they may be placed underneath it, or upon one side of it. The choice amongst these several positions must be made with a view to the relative expense, friction, stability, and convenience of the one in comparison with the others; and this will again depend upon the localities, that is, as to whether there be excavation or embankment, and whether the road be straight or much curved at the place, and finally whether there will be room for the works and their appendages. It would appear therefore, that a mode of transmitting the power which will be preferable at one inclined plane may not be so at another, and that various modes will probably be adopted as circumstances shall appear to require at the different stations.

The location of the engine and drums or sheeve wheels to work plane No. 1 may perhaps be placed with advantage in the cavity formed by a short and deep ravine which is crossed by a level part of the railway at a little distance from the head of the plane. This ravine sinks to the depth of nearly 20 feet under the grade of the road, and is 200 feet across at the road way.

The advantages of this position would be, the saving of excavation and embankment, permanency attained at less expense, more convenient to be supplied with fuel, and much more so as to the supply of water which can be brought into the ravine, from a distance of about a quarter of a mile, in pipes. The ropes would also be more out of the way of the operations upon the railway. I have accordingly made a note opposite the field notes of the 38th section in the document A, herein before referred to, signifying that it was contemplated to locate the stationary engine and fixtures in that ravine; and that it would be better to dispense with the embankment (3557 yards, for the supply of which there is no necessary excavation in the road way) and to substitute frame work on which the railway should be conducted over the ravine.

With respect to plane No. 4, there is a deep ravine upon it, across which the embankment will, in the deepest part, be

about 28 feet high, and more than 200 feet across at the surface in the direction of the road. This ravine is situated near the head of the plane, which circumstance rendered this depth of filling necessary. It was much desired by me, so to locate the plane that the stationary engine could be made to occupy a position in this ravine, for reasons similar to those advanced as to the position of the engine for plane No. 1.

It was found however, if the upper level were continued across the ravine so as to commence the descent of the plane on the other, or western, side of it, that, instead of 28 feet, the road way would be elevated 40 feet, above the bottom of the ravine, and that, since the position of the foot of the plane was fixed on account of other conditions, the grade would then become steeper than was desired.

I therefore yielded to those circumstances and laid the plane, as set forth in the field notes of section No. 3 from station No. 89 to 70, see document B, before referred to.

Upon farther reflection, I am nevertheless not clear, that it would not be better on the whole to place the engine in the ravine, and to pass the plane across it upon wood work. It is probable that the transmission of the power could not be made to take place with the same advantage as at plane No. 1, but this might be more than compensated from the circumstance of the facility of supplying the engine with water, as there is a good spring in the same ravine of a suitable height, within about 100 yards distance.

If the engine shall be placed on the level of the head of the plane, it may be supplied with water from the same spring by conducting it in pipes two or three hundred yards and pumping it through a height of 20 or 30 feet, or the supply may be obtained by a force pump from Bush creek, which would be at a distance of about 300 feet from, and 60 feet below the level of the engine, or lastly, a supply could be conveyed from the same creek at a point above the level of the engine in pipes laid through a distance of about three-fourths of a mile.

In the location of the rail road across Parr's Ridge it is contemplated to make a cut through the top of the ridge, the length of which will be about 600 feet and the greatest depth about 20 feet. The breadth of the graduated road way is to be 23 feet, and at the height of 5 feet above the road way there is to be a berm of 10 feet in width on each side. All the earth from this excavation will be wanted to complete the necessary embankments on the two planes adjacent. Across the highest part of this cut there must be a bridge to accommodate the travel-

ling on a state road which passes from southward to northward along the top of the ridge. The bridge may be of wood and cheaply constructed and must be of such height as not to obstruct the view from the engine to the foot of either plane and vice versa. The depth of the cut is perhaps sufficient for this arrangement. The descent of the planes will commence very nearly at the terminations of the excavation.

It will be expedient to place the engine nearer to the head of plane No. 3, than to that of No. 2, since No. 3 is the longest and steepest, and will require the most power. This will equalize the length of the ropes, and at the same time, to some extent, likewise that of the quantity of the power to be expended.

This arrangement will also place the engine upon ground which it is understood has been granted by William Hobbs, free of charge, for that purpose. It will also place the engine clear of the bridge before alluded to, and out of the deepest part of the excavation, and where drainage will be more convenient; and lastly, which may be of considerable importance, it will lessen the distance to the nearest supply of water.

The supply of water for this engine by reason of its elevated position upon the top of a high and narrow ridge, will be attended with more inconvenience and expense than at Nos. 1 and 4.

The spring, which appears to be the only one within reach, is situated near the line of plane No. 3, at a distance of 800 feet from the head of the plane and about 60 feet below the level of it.

On the 26th of May last I gauged the water which then flowed from this spring, (or rather springs, for there are two or three very near together) and the supply was found to be at the rate of 2300 cubic feet of water during 24 hours, which would perhaps be four times as much as would be needed for an engine of 60 horse power.

It will be proper that the supply afforded by these springs shall be ascertained in autumn, or when their discharge shall be the least, as upon the minimum supply will in some measure depend the necessary capacity of the reservoir.

The best method of conveying the supply to the engine, whether by a force pump worked by the engine itself, or otherwise, is a subject that must be well considered.

The maps and profiles of the location are in progress and will be reported as soon as they shall be completed. All which is respectfully submitted.

J. KNIGHT, *Chief Engineer.*

[C.]

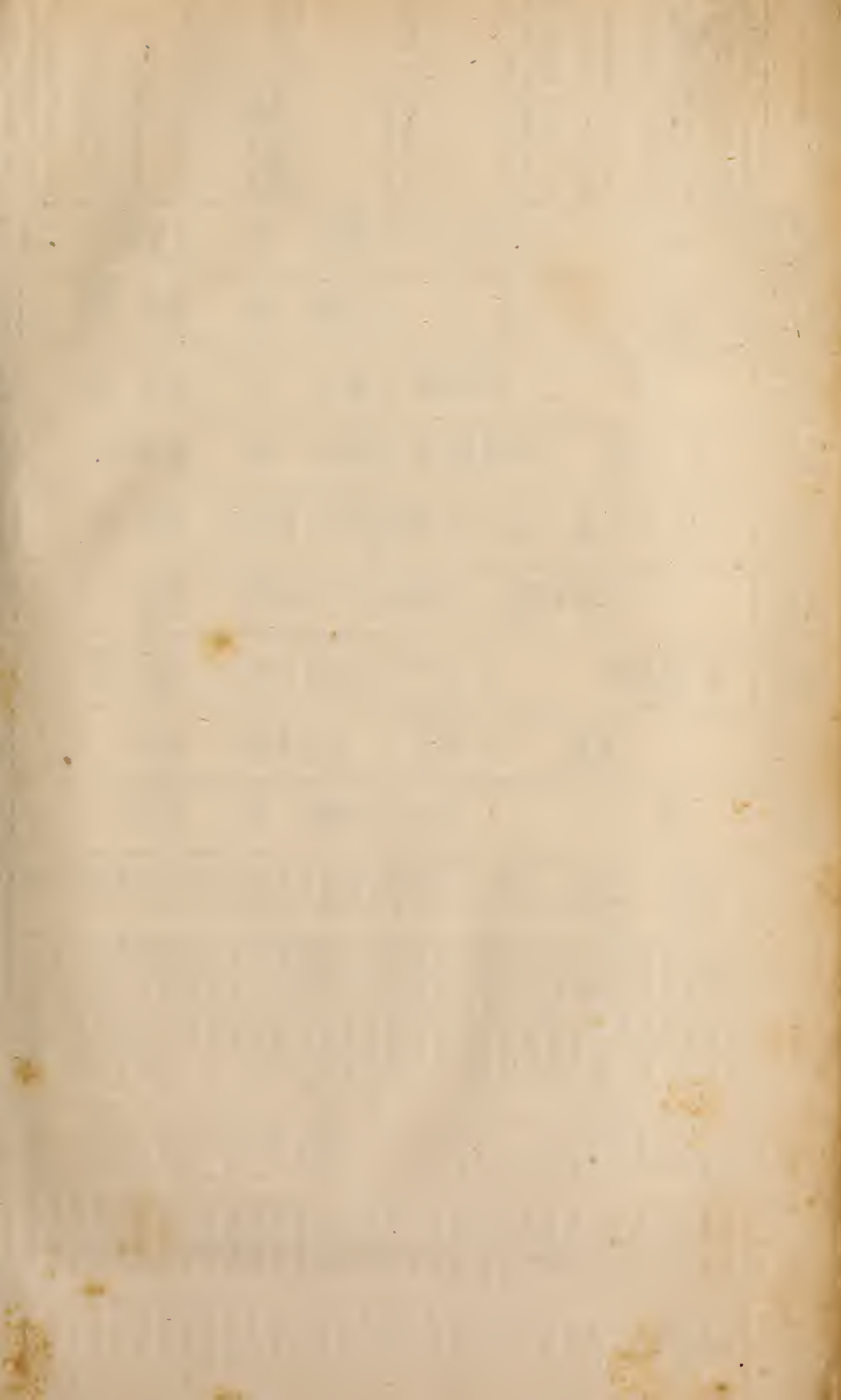
Statements of the sections and quantities of excavation and embankment on the final location, as calculated for the latter 10 sections of the 4th division, and for the whole of the 5th division, and for the lateral road to Frederick.

No. of Division.	No. of Section.	Station of commencement.	Station of termination.	Length in feet.	Cubic yards of excavation.	Cubic yards of embankment.	
4	17 *	482	523	4,100	9,355	17,452	
"	18 *	523	550	2,700	2,153	7,419	
"	19 *	550	588	3,800	22,704	18,622	
"	20 *	588	614	2,600	4,462	10,927	
"	21 *	614	642	2,800	1,959	7,360	
"	22 *	642	666	2,400	2,757	4,706	
"	23 *	666	685	1,900	3,483	5,922	
"	24 *	685	718	3,300	5,546	18,441	
"	25 *	718	733	1,500	3,505	2,845	
"	26 *	733	758	2,854	10,775	16,068	West bank of Monocacy.
5	1 *	758	787	2,865	14,247	38,824	
"	2 *	787	834	4,535	13,593	15,740	Ballinger's Creek.
"	3	834	863	2,900	13,581	11,869	
"	4	863	889	2,600	5,070	5,176	
"	5	889	908	1,900	2,258	1,696	
"	6	908	959	5,100	10,719	12,899	
"	7	959	1,019	6,000	16,016	21,593	
"	8	1,019	1,065	4,600	15,985	12,599	
"	9	1,065	1,095	3,000	4,381	4,210	
"	10	1,095	1,143	4,800	12,883	29,174	
"	11	1,143	1,172	2,900	19,259	17,766	
"	12	1,172	1,197	2,500	11,812	17,947	
"	13	1,197	1,244	4,701	20,679	16,195	Marble Ridge
"	14	1,244	1,266	2,200	1,035	6,344	
"	15	1,266	1,302	3,600	4,071	7,240	
"	16	1,302	1,342	4,000	14,137	19,412	To the Point of Rocks.
Lateral road to Fred'k.	1 *	758	28	2,775	12,381	20,012	
"	2 *	28	52	2,400	10,319	11,825	
"	3 *	52	83	3,100	6,819	6,795	
"	4 *	83	115	3,200	13,438	12,124	
"	5 *	115	182	6,687	8,884	18,264	West'n boundary of depot lot.

Distance through the depot 635 feet.

Note. Those marked * have been reported by C. W. Wever.



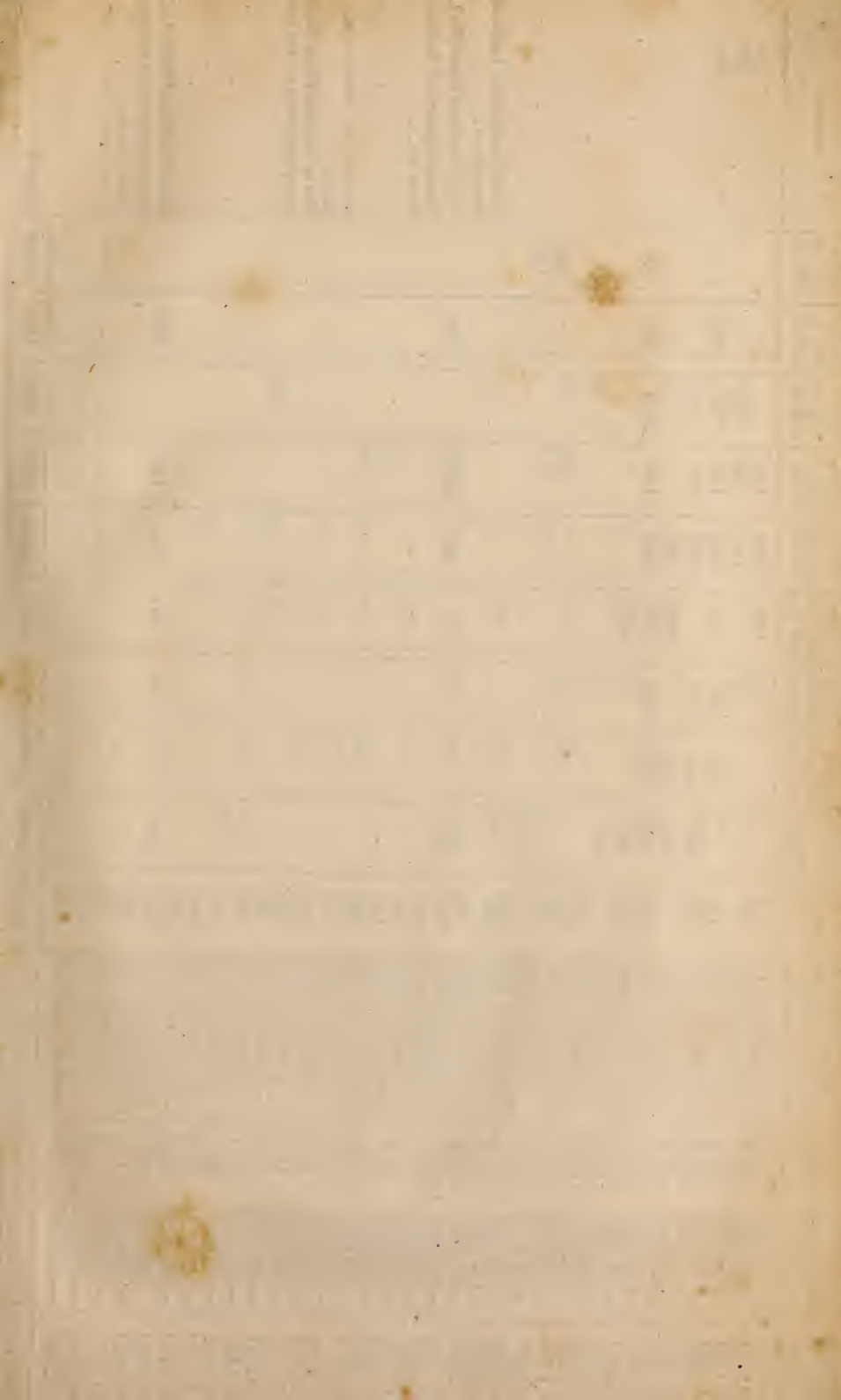


Station of grade line and elevation	Total dist. from depot at Baltimore.	Ascents and de- scents per mile in feet.	Ratio of grade, 1 in —.	Amount of each grade.	Height of road above mid tide.	Length of straight line	Curvature of radius from infra- to 5730 ft.	From 5730 to 2865 ft.	From 1910 ft. 1432.5 ft.	From 1432 to 955 ft.	From 955 to 716 ft.	From 716 to 573 ft.	From 573 to 477 ft.	From 477 to 395 ft.	REMARKS.	
262	262	000.000	Level.	000.000	66.000											Note—The point of com- mencement, from which the total distances are counted, is 262 feet east of the west- ern boundary of the depot at the head of Pratt street.
450	712	+2.640	2000	0.225	66.225	250		200								
100	3812	000.000	Level.	000.000	66.225	3100										
600	4412	+15.840	333.333	1.800	68.025	150	400	50								
200	4612	000.000	Level.	000.000	68.025			200								The sign + indicates an as- cent, the — a descent.
668	1	-13.992	377.358	1.770	66.225	618		50								
700	1,700	000.000	Level.	000.000	66.225	322		378								
900	1,1600	+5.280	1000.	0.900	67.125	300		122								
46.5	1,1646.5	000.000	Level.	000.000	67.125				78	400						End of City Division and beginning of the First Div. Carrollton Viaduct.
100	1,1746.5	-11.088	476.130	0.210	66.915				46.5							
400	1,2146.5	-13.200	400.	1.000	65.915	76.5			100							
310	1,2456.5	000.000	Level.	000.000	65.915				275.5			48	37.5			
300	1,2756.5	+10.032	526.316	0.570	66.485	37.5						272.5				First crossing of Washing- ton Turnpike.
800	1,4556.5	000.000	Level.	000.000	66.485	1662.5						100	162.5			
309	2,585.5	+20.064	263.158	4.974	71.459	426.5	50	50	200	150	120					
300	2,885.5	000.000	Level.	000.000	71.459	223.5			50							
550	2,2435.5	-16.896	312.500	4.960	66.499	150										Second crossing Washing- ton Turnpike.
147	2,3582.5	000.000	Level.	000.000	66.499	200										
632	3,934.5	+20.064	263.158	10.000	76.499	1365.5	50	100				250		100		
300	3,1234.5	000.000	Level.	000.000	76.499	300										
125	3,4359.5	-16.896	312.500	10.000	66.499	1638										Patterson Bridge.
206	5,4565.5	000.000	Level.	000.000	66.499	1,646	100	187	700	200	50			100		
315	6,600.5	+20.064	263.158	4.997	71.496	1315										
200	6,800.5	000.000	Level.	000.000	71.496	200										
560	6,2360.5	-16.896	312.500	4.992	66.504	1560										End of the First Div. at the face of the western abutment of the Oliver Viaduct.
984	8,1064.5	000.000	Level.	000.000	66.504	3383.5	470.5	150	400	1280	470	350	730	1050		
503	10,3567.5	+13.200	400.	32.657	99.161	3879.5	844.5	650	1150	1340	1030	1022	540	1857		
499	10,4066.5	000.000	Level.	000.000	99.161	39.5						200		259.5		
414	12,4480.5	+17.688	298.513	36.762	135.923	2912						2240	110	706.5	1375.5	
657	12,5137.5	+21.120	250	2.628	138.551	283.5								373.5		
117.5	12,5255	+21.120	250	.462	139.013	117										
109	13,0084	000.000	Level.	000.000	139.013	109										
10084						5,5145	1915	4540	3372	1,3860	4782.5	2180		2550	5242	

[TABLE D.—Continued.]

Length of grade in feet and inches	Total dist. from depot at Balt.	Ascens. and descens. per mile in feet.	Ratio of grade 1 in —.	Amount of each grade mid tide.	Height of F'd above mid tide.	Length of straight line.	Curvature of radius from infn. to 5730 ft.	From 5730 ft. 2865 ft.	From 2865 to 1910 ft.	From 1910 to 1432.5 ft.	From 1432.5 to 955 ft.	From 955 to 716 ft.	From 716 to 573 ft.	From 573 to 477 ft.	From 477 to 395 ft.	REMARKS.
131	15,1115	+21.120	250	+46.364	185.377	5591	300	600	400	550	800	500	1000	500	1350	Beginning of the Second Division.
100	15,1215	+16.654	316.5	+.316	185.693										100	
50	16,465	+9.504	555.5	+8.190	193.883	850	200	700	100	500	600	200	50	100	1250	
100	16,555	+9.820	537.7	+.186	194.069											
237	21,4632	+11.088	476.1	+63.917	257.986	7447	2650	1400	1100	1550	1450	2490	1950	2800	7100	Note—400 ft. of 318 grad. and 100 ft. of 337 grad. belong to this line of curvature, and form the only exceptions in the whole line, to the rule excluding all curves of a less radius than 305 feet.
100	21,4732	+11.616	454.5	+.220	258.206	100					300					
300	22,0042	+14.520	363.6	+1.650	259.856	200					1150					
416	24,3588	+11.320	466.2	+30.244	290.100	4731	1000	200	500	550		1175	700	900	3200	Beginning at the Third Division at the Forks of Patasco.
100	24,4388	+11.088	476.2	+1.680	291.780	400						100			300	
00	24,4488	+6.072	869.5	+.115	291.895			100								
25	25,4233	000.000	Level.	000.000	291.895	715	300	300	200	600	600	200	500	200	1400	
88	26,2441	+20.064	263.1	+13.255	305.150	1000	100	200	100	70		100	100	400	1418	
52	27,1513	000.000	Level.	000.000	305.150	1964	100	270	200	200	300	238	100	300	880	
03	28,1816	+14.784	357.1	+15.630	320.780	1590	163	100	200	200	1000	930	200	400	800	
79	28,4995	+21.120	250	+12.715	333.495	883					300		70		1926	
00	29,915	+10.560	500	+2.400	335.895	206						200	100		532	
34	30,1249	+30.096	175.4	+32.000	367.895	1104	200	200	220	400	200	240	200	400	2450	
33	30,1482	+11.088	476.2	+.490	368.385											
33	31,1515	+34.848	151.5	+35.065	403.450	1200		100	600	300	506	200	200	100	233	
00	31,3115	+23.760	222.2	+7.200	410.650	400						200		100	2107	
00	31,4215	+7.920	666.6	+1.650	412.300	600				100	100	100	100	100	800	
00	31,4915	+13.200	400	+1.750	414.050	700									100	
00	32,1525	+14.520	363.6	+5.195	419.245	1390		200		100	200	476		378		
55	32,4190	+17.160	307.7	+8.665	427.910	1689		200	100	100	100	150	300	20	810	
78	33,1458	+23.760	222.2	+11.600	439.510	1450						100	100	200	100	
00	33,2658	+9.768	540.5	+2.220	441.730	70	300		200							
20	34,3408	+13.200	400	+15.000	456.730	5000					300	200				
00	35,525	+18.480	285.4	+8.400	465.130	2200									200	
00	35,5325	+26.400	200	+5.200	470.330	500								100	600	
11	35,2669	+30.096	175.4	+6.500	476.830	441									493	
40	35,4369	+17.952	294.1	+5.750	482.610	1207										
95						8,1388	5313	4300	4200	1,202	1,3226	1,2419	1,290	1,1918	5,1649	Totals.





Station No.	Total dist. from depot at Baltimore.	Ascents and de- scents per mile in feet.	Ratio of grade, 1 in —.	Amount of each grade.	Height of road above mid tide.	Length of straight line	Curvature of radius from infra, to 5730 ft.	From 5730 to 2865 ft.	From 2865 to 1910 ft.	From 1910 to 143 2.5 955 ft.	From 1432.5 to 955 ft.	From 955 to 716 ft.	From 716 to 573 ft.	From 573 to 477 ft.	From 477 to 395 ft.	REMARKS.
32	36,1371	+34.848	151.5	+15.060	497.670	1540			42	100	500	100				
00	36,1871	+13.200	400	+1.250	498.930				52		100	48	300			
00	37,1961	+30.096	175.4	+30.610	529.530	2920		400	200	300	500	150	700	200		
00	38,1581	+34.848	151.5	+32.340	561.870	3135	300	365	600		200	200	100			
00	38,1981	+26.928	190.1	+2.040	563.910		100	100		100	100					
00	39,1501	+34.650	152.4	+31.500	595.410	3140	100	300	100	300	200	100	260	100	200	
00	40,0021	+37.488	140.8	+26.980	632.390	3000	400		400							
00	40,0121	+45.936	115	+8.70	633.260		100									
00	40,1030	+47.520	111.1	+8.180	631.440	909										
00	40,1280	+27.720	190.5	+1.310	632.750	90						60			100	
00	40,1380	+27.456	192.3	+5.520	633.270										100	
00	40,1680	Level.	Level.	000.000	633.270	300										
00	40,3730	+197.208	26.7	+76.565	709.835	2050										Commencement of Inclined Plane No. 1.
00	40,3830	+201.168	26.2	+3.810	713.645	100										End of Inclined Plane No. 1.
74	41,2224	000.000	Level.	000.000	713.645	757	500			617	500	1000	300			Commencement of Inclined Plane No. 2.
00	41,5024	+170.280	31.	+90.300	803.945	2800										
00	41,5124	+227.304	23.2	+4.305	808.250	100										
00	41,5224	+264.000	20.	+5.000	813.250	100										
00	42,544	000.000	Level.	000.000	813.250	600										Summit of Parr's Spring Ridge.
00	42,744	-368.544	14.3	-13.960	799.290	200										End of Inclined Plane No. 2.
00	42,844	-345.322	15.3	-6.540	792.750	100										Commencement of 4th Div.
00	42,914	-322.080	16.4	-6.100	786.650	100										
00	42,1044	-298.848	17.6	-5.660	780.990	100										
00	42,1144	-275.616	19.1	-5.220	775.770	100										
00	42,1614	-264.000	20.	-25.000	750.770	500										
00	42,3644	-245.520	21.5	-93.000	657.770	2000										
00	42,3744	-219.120	24.1	-4.150	653.620	100										
87	43,2251	000.000	Level.	000.000	653.620	1037	800	700	100	200	300	150	500			End of Inclined Plane No. 3.
00	43,2351	-310.728	17.	-5.885	647.735	100										Commencement of Inclined Plane No. 4.
00	43,2451	-281.952	18.7	-5.340	642.395	100										
00	43,2551	-255.024	20.7	-4.830	637.565	100										
00	43,2651	-235.752	22.4	-4.465	633.100	100										
3562						4.5058	2300	1865	1094	2017	2400	1808	1360	1100	400	Totals.

Station	Total dist. from depot at grade line, in miles and feet.	Ascents and descents per mile in feet.	Ratio of grade 1 in —.	Amount of Height above tide in feet.	Length of straight line.	Curvature of radius from inf. to 5730 ft.	From 5730 to 2865 ft.	From 2865 to 1910 ft.	From 1910 to 1432.5 ft.	From 1432.5 to 955 ft.	From 955 to 716 ft.	From 716 to 573 ft.	From 573 to 477 ft.	From 477 to 395 ft.	REMARKS.
00	43,4051	—229,416	23.	—60,830	572.270	1400									End of Inclined Plane No. 4.
00	43,4351	000,000	Level.	000,000	572.270	300									
00	43,4751	—31,680	166.6	—2,400	569.870										
76	44,247	—52,800	100	—7,760	562.110	776									
00	44,947	—37,488	140.8	—4,970	557.140										
00	44,1347	—52,800	100	—4,000	553.140	400									
40	46,2457	—37,488	140.8	—83,070	470.070	1000	1700	2000	2420	400					
00	46,4387	—26,400	200	—9,500	460.570	100	100		100	500					
00	47,807	—34,848	151.5	—11,220	449.350	1300			300	400					
00	47,1307	—30,096	175.4	—2,850	446.500	100			100						
00	47,1907	—34,848	151.5	—3,960	442.540	100	500								
00	47,4307	—30,096	175.4	—13,680	428.860	300	300		100	700	1000				
00	47,5107	—26,400	200	—4,000	424.860	200	100		400		800				
00	48,527	—30,096	175.4	—3,990	420.870	200					600				
00	48,1127	—29,304	180.2	—3,330	417.540	100	300	200			100				
00	48,4627	—28,512	185.1	—18,900	398.640	100	300								
00	48,5027	—17,424	303.	—1,320	397.320	3300	100		600		400				
00	49,4447	—24,024	219.8	—21,385	375.935	100									
00	49,4847	—21,912	541.0	—4,15	375.520	400					500				
00	50,667	—12,144	434.7	—3,220	372.300	300	100	100	100	100					
20	51,687	—20,064	263.1	—20,140	352.160	2500	100	300	100	800	1100				
00	51,1387	—24,024	219.8	—3,185	348.975	500									
00	51,2887	—14,520	363.6	—4,125	344.850	800									
00	52,707	—24,024	219.8	—14,105	330.745	1600	400	300	200	400					
00	52,2607	—18,480	285.4	—6,650	324.095	700	300		100	100					
00	52,3607	—11,352	465.1	—2,150	321.945	900			100	100					
00	53,427	—21,120	250.	—8,400	313.545	600	100			100					
00	53,2827	—15,840	333.3	—7,200	306.345	200	800			100					
00	54,747	—21,120	250.	—12,800	293.545	900	200	100	100						
00	54,1247	—9,768	540.5	—9,23	292.620	500									
00	54,2147	—21,120	250.	—3,600	289.020	500	500								
00	54,4747	—24,024	219.8	—11,830	277.190	900		200	100	400					
00	54,4847	—18,744	281.7	—3,355	276.735	100									
00						4	1436	1	1020	4400	2400	4030	4500	4400	4900

Note. The curve of 900 feet in length in the column of curvatures between 477 ft. and 395 ft. has a radius of 441 feet, and is the only case occurring on the fourth division in which the radius of curvature is less than 477 feet.

Note. The curve of 900 feet in length in the column of curvatures between 477 ft. and 395 ft. has a radius of 441 feet, and is the only case occurring on the fourth division in which the radius of curvature is less than 477 feet.





[TABLE D.--Continued.]

Stations and grade	Total dist. from depot at Baltimore.	Ascents and de- scents per mile in feet.	Ratio of grade, 1 in —.	Amount of each grade.	Height of road above mid tide.	Length of straight line from infm. to 5730 ft.	Curvature of radius from infm. to 5730 ft.	From 5730 to 2865 ft.	From 2865 to 1910 ft.	From 1910 to 1432.5 ft.	From 1432.5 to 955 ft.	From 955 to 716 ft.	From 716 to 573 ft.	From 573 to 477 ft.	From 477 to 395 ft.	REMARKS.
400	54,5247	000.000	Level.	000.000	276.735	400		300	200	200	800	200				
500	55,3767	-24.024	219.8	-17.290	259.445	2100										
100	55,3867	-20.320	259.7	—385	259.060	100										
400	56,0957	000.000	Level.	000.000	259.060	900	500	200	500		100	200				
100	56,1057	+10.560	500	+200	259.260	100										
200	56,2257	+21.120	250	+4.800	264.060	500										
815	56,3102	000.000	Level.	000.000	264.060	415										
500	56,3602	-13.200	400	-1.250	262.810	400										
300	56,3902	000.000	Level.	000.000	262.810	300										
100	57,1722	-21.120	250	-12.400	250.410	2700										
100	57,1822	-18.480	285.4	—350	250.060	100										
033	57,4855	000.000	Level.	000.000	250.060	2233		500			200					
1500	58,3075	+30.096	175.4	+19.950	270.010	3500										
400	58,3475	+16.368	322.5	+1.240	271.250	400										
200	58,4675	+5.280	1000.	+1.200	272.450	600										
900	59,1295	+26.400	200.	+9.500	281.950	1900										
400	59,1695	000.000	Level.	000.000	281.950	400										
3700	60,0115	-24.024	219.8	-16.835	265.115	3000										
300	60,0415	000.000	Level.	000.000	265.115	300										
1100	60,1515	+13.200	400	+2.750	267.865	1100										
4420	62,0655	+22.704	240.5	+41.710	309.575	1,3720	300	400								
1000	62,1655	000.000	Level.	000.000	309.575	1000										
300	62,1955	-9.504	555.5	—540	309.035	300										
920	63,2875	-22.704	240.5	-26.660	282.375	1,520	300	100	400							
1600	63,4475	000.000	Level.	000.000	282.375	1200										
5100	64,4295	+14.784	357.1	+14.280	296.655	2500	100	500	1900	100						
1200	64,0215	000.000	Level.	000.000	296.655	600										
200	65,0415	-16.104	327.8	—610	296.045	200										
2540	67,2955	-30.096	175.4	74.670	221.375	1,3620	200	300	2700	1000						
2,3388						9,3428	1400	3600	1,0920	1800	2300	500				

Monocacy Viaduct and be-
ginning of Fifth Division.Point of Rocks on Potomac
river and end of 5th Division
Totals.

[TABLE D.—Continued.]

Exhibiting the grades and curvatures of the Lateral Road to Frederick.

Length of each grade in miles and feet.	Total dist. from depot at Baltimore.	Ascents and descents per mile in feet.	Ratio of grade 1 in —.	Amount of each grade in feet.	Height at middle of straight line.	Length of straight line.	Curvature of radius from middle to 5730 ft.	From 5730 to 2865 ft.	From 2865 ft. to 1910 ft.	From 1910 ft. to 1432.5 ft.	From 1432.5 to 955 ft.	From 955 to 716 ft.	From 716 to 573 ft.	From 573 to 477 ft.	From 477 to 395 ft.	REMARKS.
200	56,4002	000.000	Level.	000	262.810				WEST FORK.					200		West Fork begins at station 769 of main stem, 900 feet west of East Fork.
500	56,4502	+30.096	175.4	+2.850	265.660									500		
100	56,4602	000.000	Level.	000.000	265.660									100		
800									EAST FORK.					800		
200	56,3102	000.000	Level.	000.000	264.060						100			100		East Fork begins at station 760 of the main stem on the west bank of the Monocacy.
400	56,3502	+21.120	250	+1.600	265.660									400		
110	56,3612	000.000	Level.	000.000	265.660									100		
100	56,3712	+10.560	500	+2.00	265.860	100				300						
1600	57,0032	+30.096	175.4	+9.120	274.980	700										
2900	57,2932	+17.952	294.1	+9.860	284.840	1200	100									
2500	58,152	+30.096	175.4	+14.250	299.090	2200										
1100	58,1252	000.000	Level.	000.000	299.090	1100										
500	58,1752	-10.560	500	-1.000	298.090	200										
200	59,1672	-17.952	294.1	-17.680	280.410	4000										
100	59,1772	-16.896	312.5	-320	280.090	100										
2794	59,4466	000.000	Level.	000.000	280.090	1994										
1664						2,1034	100	1100	2300	500	400	500	300	600		Totals.

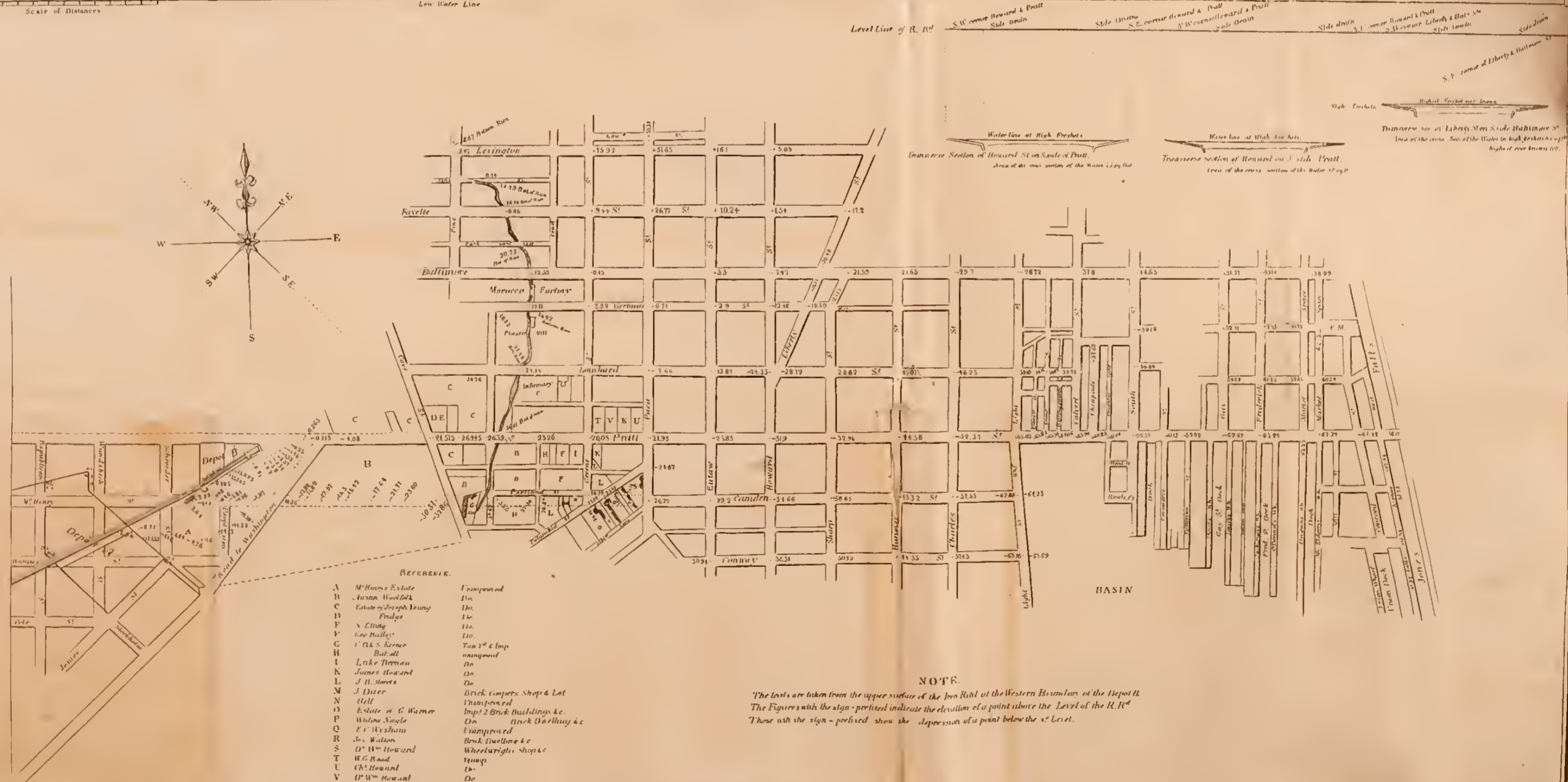
The total distance from Baltimore is counted by the East Fork. The distance of the depot at Frederick from the main stem, by the East Fork is 3,1664 feet and by the West Fork 3,1754 feet. The East Fork is 716 feet long.

Depot of Company on Birely's lot, Frederick city.



Plan and Profiles

Illustrating the Report of
J. KNIGHT, Esq. BALTIMORE R.R. CO.
upon the Subject of the extension of that Road
into the CITY of BALTIMORE as now improved



[E.]

ENGINEER'S OFFICE, BALTIMORE AND OHIO RAIL ROAD,
Baltimore, Feb. 3d, 1831.

TO PHILIP E. THOMAS, Prest. &c.

In pursuance of thy order of the 26th of August last, examinations have been made with a view to the extension of the Rail Road from the Depot on Pratt street into the city, on such plan and route as appeared most eligible and best calculated to accommodate the trade of the city, as now improved; and I now respectfully report,—

That in consequence of the pressing engagements of all my assistant Engineers in the execution of work which would not admit of delay, I called to my aid Thomas Poppleton, who was recommended as being well qualified. Some delay at first occurred in consequence of his temporary absence from the city, but after his return, the examinations and measurements were duly prosecuted.

His written report, accompanied by a map of the plans and by a map of profiles, is herewith presented, each of which is marked A.

The map of plans embraces all those parts of the city through which it was probable the most direct and feasible route or routes for a railway or railways, to pass from the Depot at present established on Pratt street, and from the site for a Depot west of it, (since granted by James Carroll) to tide water. It also covers to a great extent such parts of the city as may be accommodated with branch railways to be laid along the streets, when the citizens shall deem such extensions necessary and proper for the accommodation of trade.

The levels of the streets are indicated by figures written in red and black near their intersections, and show their heights above, or below the level of the present railway where it enters the depot first above mentioned, and which is about 66 feet above tide. The depth below that level is marked by the figures in red, and the height above the same level is shown by those in black.

This map also contains the cross sections of Howard street at Pratt street, and of Liberty street at Baltimore street, shewing the rise and cross section of the water which passes on the same during freshets, and for which provision must be made in case those streets shall be passed by a railway.

The other map contains the profile of Camden street from the main line of the rail road as now constructed, to the basin; also the profile of the direct line of the rail road passing on the south-

ern side of the depot first mentioned, to Pratt street, thence of Pratt street to the Basin, and to Jones' Falls.

For more convenient reference, a condensed map with profiles is hereto annexed, on which all the figures indicative of levels are written in black, those above the level of the rail-road at the depot are designated by the \times sign prefixed.

Previous to entering upon a description of these routes indicated by these maps, as eligible, it may be proper to observe, that in pursuance of a plan to convey the rail road to the City Block by way of a route that should pass near the Washington Monument, and through Lexington hill by means of a deep cut or tunnel, a route was accordingly run under the direction of Colonel Long and reported. The order for the surveys now reported was not understood as embracing a re-examination of the route just adverted to, but as requiring the examination of additional routes by which a comparison might be made of those most eligible.

It was at all times obvious, that should a question be made in relation to the location of the necessary route or routes which would be required to connect the main stem of the rail road with navigable water, and that should a decision of that question be made abstractly, and untrammelled by, or in disregard of, the condition which was originally, and without doubt properly annexed, to wit, of accommodating the trade of the City as now improved,—several routes having the requisite properties, offer on the south, highly eligible in their character. But I have no hesitation in giving it as my opinion, that, with a view to the least expense in the construction as well as in the transportation, and also as regards the accommodation of the trade of the city as now improved, a branch railway by the route of Camden street, or by Pratt street, to the Basin, and thence by Pratt street to the City Block, in accordance with the grades hereinafter mentioned, will be the most eligible.

The description of these two routes and the effective power upon them may be as follows, to wit:

PRATT STREET BRANCH.

To commence at a point on the straight part of the rail road situated at its intersection with a prolongation of Camden street westward, and about 215 feet westward from the western boundary of the depot at Pratt street (now called depot B,) and running thence towards the improved parts of the city, and in a direction in continuation of the said straight part of the rail road:—Level 215 feet to the western boundary of depot B, and at a point about 7 feet south of the present rail road at that place.

Thence level 200 feet to a point where the cutting is 15 feet deep:

Thence descending 1 in 70, or at the rate of 75 feet per mile, a distance of 317 feet to a point nearly coincident with the surface of the ground about 50 feet in advance of the eastern end of the carriage house of the company on depot B, and passing 73 feet to the southward of it:

Thence the same descent 250 feet to the centre of Pratt street, where the depth of cutting will be about 8 feet:

Thence the same descent, but making an angle of 24 degrees to the right, in order to assume the direction of Pratt street, and continuing along the middle of the same 274 feet, to a point 123 feet eastward from the Washington road. The cutting has continued nearly uniform to this place, where it is about 8 feet deep. The angle here mentioned may be turned within a length of 200 feet at a radius of curvature not exceeding 400 feet:

Thence the same descent a distance of 561 feet to the intersection of Cove street, and coinciding with the level of that intersection. Average depth of cutting, 4 feet.

Thence the same descent 130 feet, to a point where the filling will be a depth of $1\frac{1}{2}$ feet:

Thence level to Paca street, as follows, to wit:

81 feet to a point opposite Sylvester Clifford's house, where the filling will be a depth of 4 feet.

167 feet to the intersection of the west side of Penn street, where the filling will be 4 feet deep.

77 feet to the west side of Chatsworth run, where the filling will be a depth of 3 feet.

258 feet to the west side of Emory street, where the filling will be about 2 feet deep.

352 feet to Green street, where the cutting will be 2 feet deep.

409 $\frac{3}{4}$ feet to the surface at the intersection of Paca street.

Thence in conformity with the present grade of Pratt street to the Basin, to wit:

473 $\frac{3}{4}$ feet, descending 1 in 112 $\frac{1}{2}$ or 47 feet per mile, to a point 50 feet east from Eutaw street.

321 $\frac{3}{4}$ feet, descending 1 in 70, or 75 feet per mile, to Howard street.

409 feet, descending 1 in 70, to Sharp street.

454 feet, descending 1 in 70, to Hanover street.

378 feet, descending 1 in 48 $\frac{1}{2}$, to Charles street.

420 feet, descending 1 in 38, to the intersection of Light street, at an elevation of about $1\frac{1}{2}$ feet above the bottom of the ditch.

RECAPITULATION.

415	feet level.
567	feet, descending 1 in 70, to Pratt street.
965	feet, descending 1 in 70.
1344 $\frac{3}{4}$	feet level to Paca street.
473 $\frac{3}{4}$	feet descending 1 in 112 $\frac{1}{2}$, across Eutaw street.
1184 $\frac{3}{4}$	feet, descending 1 in 70, to Hanover street.
378	feet, descending 1 in 48 $\frac{1}{2}$, to Charles street.
420	feet, descending 1 in 38, to Light street.
<hr/>	
5748 $\frac{1}{4}$	Total.

Having thus reached the water at the Basin, the railway could be conducted on the grade of Pratt street, or so nearly coincident with it as not to derange the same, and extremely near to a level, to Jones' Falls, which it could be made to cross to the City Block, and be conducted to such other place as might be expedient and proper.

EFFECTIVE POWER OF A HORSE.

Up the ascent of 1 in 38, a horse of average strength, that is, of a muscular energy equal to 250 lbs. traction, will draw one car with its maximum load, being a gross weight of 6720 lbs. He will continue this performance to Hanover street 798 feet; after which, the next steepest grade is 1 in 70, up which his draught will of course be easier, but not such as to enable him to draw two loaded cars. It will be easy, however, to employ horses capable of occasionally exerting a traction of 300 lbs. One of these would draw the two cars up the ascent of 1 in 70, whilst he would be unable to draw two cars in the train up the ascent of 1 in 38. Hence it may be economy to use additional horses between Hanover street and the Basin, and possibly, also, on other parts.

CAMDEN STREET BRANCH.

Commencing within the limits of Depot A, (the ground conveyed to the company by James Carroll) thence slightly diverging to the right from the direction of the main line.

90 feet descending 1 in 110, or at the rate of 48 feet per mile, to the eastern boundary of depot A; thence the same descent 350 feet, to a point opposite the intersection of the present rail road with the prolongation of Camden street, where the Pratt street route just described was made to commence, and 4 feet under the level of that commencement, also nearly coincident with the natural surface of the ground,

Thence entering the line of the middle of Camden street, with a proper curvature, the railway will continue along the same as follows, that is to say:

700 feet at the same descent (1 in 110) to the middle of the Washington road, and at the surface of it. The extreme depth of cutting will be about 8 feet. Average about $4\frac{1}{2}$ feet:

Thence 601 feet at the same descent to a point where there will be 2 feet filling. The average filling will be about $1\frac{1}{2}$ feet:

Thence $522\frac{1}{2}$ feet at the same descent, to the fence on the east side of Woolfolk's enclosed ground, where there will be a filling to the depth of 12 feet. Average about 7 feet:

Thence 261 feet at the same descent, passing through C. D. & S. Keener's tan-yard and improvements, to the top of the bank on the east side of Chatsworth run, and west side of Penn street, where the filling will be 12 feet deep—average about 14 feet. A bridge will here be required across this run similar to that already erected at Pratt street, across the same run, and possibly a culvert may also be required, at the gully near the fence. Here this line will be about 2 feet lower than the level of the line on Pratt street, opposite.

Thence $327\frac{1}{2}$ feet at the same descent to the east side of Emory street, at $1\frac{1}{2}$ feet filling. Average filling, 6 feet.

Thence 805 $\frac{1}{2}$ feet, level, and nearly coinciding with the surface of the streets, to the east side of Paca street, at the surface of the street. This level is the same as that of the surface of the ground at the cross fence at Dr. Warner's office. It also very nearly conforms to the surface of Columbia street. This level is 4 315-1000 feet lower than that on Pratt street opposite, and which was also to terminate at Paca street. It may here be remarked, that as Camden and Pratt streets are about 415 feet asunder, the grade between them would ascend from the former to the latter, at the rate of 1 in 96, or 55 feet per mile. From Penn to Emory streets the line passes through Austin Woolfolk's lot, thence to Columbia street through a lot belonging to John B. Morris, and through John Duer's lot and brick cooper's shop, and a lot of — Bell: Thence to Paca street through a corner of the widow Nagle's lot, through a lot belonging to the estate of George Warner, and through two brick dwellings on the same: Thence through lots of E. C. Wysham, Joseph Walton, and a corner of Dr. Wm. Howard's lot: Thence to Sharp street, crossing Eutaw and Howard streets, and conforming to the present grade of the street.

1163 feet descending at 1 in 94, or about 56 feet per mile. Thence the same descent, and still conforming to the grade of the street 321 feet to a point 100 feet west from Hanover street:

Thence 600 feet descending 1 in 38, (the extreme grade on Pratt street) cutting $1\frac{1}{2}$ feet at Hanover street, and filling $1\frac{1}{2}$ feet at Charles street:

Thence in conformity to the present grade of the street, 311 feet, descending 1 in 74 to the west side of Light street wharf.

RECAPITULATION.

440	feet,	descending 1 in 110, to Camden street, and opposite the proposed commencement of the Pratt street route.
2411 $\frac{3}{4}$	"	descending 1 in 110 to Emory street.
805 $\frac{1}{4}$	"	level to Paca street.
1484	"	descending 1 in 94 to 100 feet, west of Hanover street.
600	"	descending 1 in 38 to 90 feet, east of Charles street.
311	"	descending 1 in 74 to Light street wharf.

6052 Total.

EFFECTIVE POWER.

As on Pratt street, so on this, one horse will draw a loaded car up the steepest ascent. And on every ascent westward, from a point 911 feet from the wharf, he will draw two loaded cars by exerting about an equal force—whilst he will draw on either route in a direction towards the Basin, any train which will be within his power on a level, and which can be regulated in its descent on the steeper parts by the application of the brake.

PRACTICABLE CHANGE IN THE ROUTE OF CAMDEN STREET.

Should it be found too expensive, by reason of the several lots and improvements herein before mentioned, to pass on the line proposed directly from Cove street to Paca street, then an alternative will present of passing along Portland street from Cove street to Columbia street; whence it could reach the intersection of Paca and Camden streets by a diagonal direction, passing through by the letters Q and R on the map, and so as not to touch any building. In approaching the west end of Portland street, the direction, merely, of Camden street might be changed so as to intersect Cove street opposite to Portland street.

PRACTICABLE LINES ALONG WHICH ADDITIONAL
LATERAL RAILWAYS MAY BE EXTENDED WITH-
IN THE CITY IN OTHER DIRECTIONS.

1. A route passing up in the vicinity of Chatsworth run on a line which proper examinations might designate, to Lexington street, where a Depot would be established. Thence it might be continued, if necessary, as far north as to Franklin street, with such sub-branches as might be necessary. This route could be made to leave either of the proposed branches on Pratt or Camden streets, with a simple turn out and switch, after the same shall have crossed Cove street. It could therefore be used with as great facility as any other part of the Rail Road, and such Depots might be established between Camden and Lexington streets as the demands of trade might there require. One horse could draw two loaded cars on this line.

2. From Camden, or from Portland street, a route might pass, with a proper curvature and the use of switches, into Paca street by the way of Columbia street, whence a track could be conducted in conformity to the present graduation of Paca street to the Lexington market. A horse capable of a traction of 300 lbs. would draw one laden car up the steepest parts.

3. A route up Eutaw street. This would not be quite so steep as that up Paca street, and might be extended to the northern limits of the city.

4. Howard street. By means of a turning platform or of some other device having an equivalent effect, a route might proceed up this street even to Franklin street, without encountering an ascent or descent greater than about the same as on Pratt street near the basin, on which a horse would draw one loaded car.

5. Or, a route might pass up Liberty street to Lexington street, and thence along Lexington to Howard. From Liberty street a track might be made to pass down Baltimore street to any point desired. In case of using Liberty street for a Railway, it would be necessary to conduct the water along underneath it by means of a culvert.

6. It will be practicable to run a Railway southward along any street intersecting Camden or Pratt street to such distance and to such water or Depot as may be accessible or expedient.

7. The railway from Pratt street may be made to enter Cheap-side, where there is a highly favorable position for a Depot, which may extend across Lombard street to Water street on the north, to within 450 feet of Baltimore street at its intersection with Calvert street, and may be of such width as shall be required.

8. The Depot at Cheapside can also be approached by a railway on Lombard street that shall turn into either Charles or Hanover street, and thence to Pratt or to Camden street.

9. A railway could be laid on South street to any desirable distance to the north, and south to the water. The same may be remarked in relation to other streets further east.

It will be seen, therefore, that the graduation of the streets as they exist at present, will admit the introduction of railways into almost all parts of the city, wherever it may be thought proper to lay down lines of that description; and that the necessary Depots may be established to carry this system of diffusing the trade into full effect. The railways on all the routes designated would be such as to enable one horse to draw a car, carrying from two to two and a half tons of freight.

It is not, however, intended to recommend the construction of any one of these lines here declared to be practicable, but only so far to comply with the order under which I am acting as to show what may be done should it be required in future.

But in relation to the routes by which it is intended to connect the Baltimore and Ohio Rail Road with navigable tide water, I have no hesitation in saying that the demands of trade will be imperative.

That without such connection an onerous and unnecessary tax will be virtually levied on both producer and consumer throughout the whole extent of trade or country affected by the Rail Road, and that the disadvantage of this might be so great as to create a serious rivalry which it might not be possible to allay or effectually to counteract.

A Railway into the improved parts of the city is also necessary for the conveyance of passengers and their baggage to and from the main line of the Road.

The moving power to be employed on the branches herein before described, or on such others as shall be made within the improved parts of the city, it is conceived, must be that of horses, and not steam.

Stationary power, with its necessary appendages of planes, ropes, chains, and sheeves, cannot be admitted into a public street.

The Locomotive Engine would also be objectionable on many accounts which it is not thought necessary to enumerate. Suffice it to say, that the graduation of the streets generally, or of the various branches likely to be adopted within the city, are not, and will not be such as to favor the advantageous use of that Engine. Moreover, it would not be prudent to establish a high-

er velocity than the walk of a horse, to wit, about two and a half miles per hour, which fortunately for the case before us, is also the velocity at which his useful effect will be a maximum.

Considering the short length of the branches, their changes of direction, and the slow speed, it is believed that horse power will be the most advantageous in every respect, whatever may be the graduation.

From the absolute necessity of many branches being made to radiate from a Railway, on which the tonnage and travel will be very great and various, to and into a great emporium such as the city is destined to become, it will be found expedient to make the principle routes of departure commence as soon as practicable, in order to avoid confusion and detention. Consequently it will be proper to characterise as branches, all routes from, or in continuation of the present line, into the city.

The main line of the Rail Road terminating at Depot B, on Pratt street, it is evident that a sufficient number of branches must be made from that place or from some point or points westward of it, to relieve the main line of the immense traffic and intercourse which will pass upon it from the West, and also to enable it to receive that which will go upon it from the East. And it is evident that from the necessary delays at depots, and from the reduced speed on these branches, many of them will ultimately be required; and that if they shall not approach the tide, at one place, they will from necessity be made to do so at another.

In regard to this alternative, it may again be remarked, that the vicinity of Baltimore has many advantages, both as respects fine navigable basins and sheets of water, and easy routes in various directions, which the surface of the ground affords for lateral railways, from the main stem to the tide.

The routes through Pratt or Camden streets are alike practicable, and would not be very expensive of execution. The cost, however, cannot be estimated at present. It will, nevertheless, be such as to bear no comparison to the benefits to trade which would be conferred.

The breadth of these two streets are the same, to wit, about 40 feet between the curbs.

It would be proper perhaps to lay but a single track in the same street. This would, for the accommodation of loaded cars, occupy a breadth of 10 feet in the middle of the street, leaving 15 feet on each side clear of the cars and the curb stones for the free passage of carriages, carts, drays, &c. If two tracks were

laid, then this remaining breadth would be reduced to 10 feet on each side.

The Railway should be laid with continuous stone sills, and so that the top of the iron rail should not be elevated more than two inches above the level of the street near the same, and so that all carts or other vehicles moving on the street should be able to pass over the same in any direction without difficulty.

On this plan the travelling on the street would not be impeded by the railway. The only impediment which could be apprehended, would be from the cars during their passing. But these would consist of few at a time, and would move with a moderate velocity, so that they could be instantly checked, and if necessary brought to a pause in the distance of a few feet.

The laying down of railways in the streets of towns, is not without precedent. It has been done in Bolton, Stockton, and other towns.

The plan herein proposed, of forming the road with stone sills under the iron, will be less detrimental to the free passage across or along it, than any which has been adopted. And it is not believed that it will form an injurious impediment, at the crossing of streets, for although the railway must maintain at these places a uniformity of grade, yet the water ways may be so formed, as to allow of the necessary drainage, without impeding the travelling upon the street.

In case of a single track in both Pratt and Camden streets, the cars might go down on the one and return on the other, or they might go and return on the same track on different portions of the day. This latter mode would become necessary, in case but one track shall be made from the main line to the Basin.—One track, however, will ultimately be wholly insufficient for the demand, and as soon as the amount of tonnage shall accumulate so as materially to interfere with the other business of the street, any further increase should be checked by opening other avenues.

Respectfully submitted.

J. KNIGHT, *Chief Engineer.*

(F.)

Engineers Office, B. & O. R. R. }
 Baltimore, July 6, 1831. }

TO HENRY J. RANNEY AND BENJ. H. LATROBE,
Ass't Engineers.

The president and directors of the Baltimore and Ohio rail road company having resolved to cause a route for a railway to be located that shall connect the cities of Baltimore and Washington, and which shall branch out or depart from the Baltimore and Ohio rail road, at some suitable or convenient point near the Patapsco river, and the president of the company having directed the chief engineer to carry into effect the said resolution, I therefore select and appoint you as my principal assistants, to aid me under these and such other and further instructions as I may from time to time give you, in executing the necessary preparatory measures, surveys, levellings, drawings, and calculations incident to the location of the route of the contemplated railway, as well as, in those which the location itself shall involve.

As no precise or definite opinion in the present state of our information of the localities of the country can with certainty, be formed with regard to the selection of the particular route which shall be best adapted for the purposes of this railway, it follows, that the preparatory measures, surveys, levellings, drawings, and calculations, must be made to precede our conclusions with regard to the position of the best route for the location; and consequently, the instructions now given will extend only to embrace all such arrangements, examinations, surveys, &c., as shall be necessary in order to indicate the ground most suitable for the location.

You will regard as the basis of these examinations and surveys, my report and map of a reconnoissance of routes for a railway between the points aforesaid, made during the last winter, in company with one of yourselves (B. H. Latrobe) as my assistant, and submitted to the president of the company, under date of the 22d of January last, a copy of which is herewith furnished, and the map will now be referred to.

The routes and lines to be surveyed and levelled, will be of two descriptions, to wit:

1. Routes to lead in the direction towards Washington, as probable, or experimental lines of location. These will give the *longitudinal* profiles of the country.

2. Lines run transversely of the former to the right and to the left, by which the *transverse* profiles of the country will be known.

The routes of the first description will include all those re-

commended in the report just cited, and designated on the said map, as worthy of survey, together with such other routes or parts of routes as the survey of these shall indicate as having just claims to attention, from their directness, easy grade, or the facility of construction which they, or any of them, shall offer.

These routes will be properly connected with each other in the surveys and levels, so that the maps, profiles, and calculations, shall allow of a comparison to be instituted with regard to them respectively. For the present they will also be made to connect with the Baltimore and Ohio rail road at some point or points between the great embankment at Gadsby's run and the end of eight miles from the boundary of the city of Baltimore, and shall terminate at the boundary line of the city of Washington, near to the place contemplated in the report aforesaid, as the most suitable entrance of the railway into that city.

The route which shall, as nearly as may be, coincide with the line for a canal, as run by Dr. Howard, and designated on the map by the letters A, B, C, D, E, F, G, H, I, K, shall be assumed as the base of all the surveys of both descriptions, and to which they will all be referred by appropriate intersections.

This plan, it will of course be understood, is adopted for the sake of promoting accuracy and convenience in the field operations, and not with any view to a preference in favor of this over any other route, which can only be made when it shall be found that the facts to be developed by the surveys shall authorize it.

The lines of the second description, and which are to be surveyed and levelled in order to ascertain the profiles of the country transversely to the general direction of the experimental routes for location, will be at least five in number, that is to say,

1. Commencing in the depression of the ridge which divides the waters of the Patapsco from those of the Patuxent, and where the canal route intersected the same, at the letter C, on the map, lines of surveys and levels will be continued to the north west and to the south east, that is, to the right across the turnpike, and to the left in the direction towards Annapolis, and passing on the apex of the said dividing ridge.

2. Similar lines will also be run to the right and left along the margin of the north branch of the Patuxent river, beginning at the point where the canal route crossed the said stream.

3. Likewise, commencing on the canal line near the letter E, on the map, lines will be run to the right and left along the top of the ridge between the two branches of the Patuxent.

4. Lines will also be, in like manner, run and levelled along the margin of the principal branch of said river, setting out where the canal route crossed the same.

5. The ridge dividing the waters of the Patuxent and the Potomac, will also be traced in like manner, to the right and left of the point F.

These transverse lines will be continued across the country to an extent sufficiently wide to embrace all the routes which may probably be run for the line of the railway, whether to the right or to the left of the canal route. The most favorable passes which these ridges afford, will be carefully examined and noted, and frequent references will be taken to the beds of the two branches of the Patuxent, so as to ascertain their levels and the quantity of fall in each, through the whole extent of these surveys to the right and left.

With regard to the point where this railway may be made to branch off from the Baltimore and Ohio rail road, it is possible that this might take place with advantage near Avalon. The route would there cross the Patapsco on a level 66 feet above mid-tide, to a point on the slope of the ravine formed by a stream which there enters the Patapsco from the westward. The route would then ascend this ravine to some point, if any such should present, where it would be practicable to pass the ridge and to gain the slope of Deep run, or one of its branches, Buds run for instance, whence it could be made to intersect the route by the ravine of Deep run; or, instead of so passing the said ridge, the route might be continued further up the first mentioned ravine to some other practicable pass, through which the route could be conducted, either into the route on the slope of Deep run, or past Merrill's to an intersection near to the Savage factory. Inasmuch as this route has not been examined with these views, it will be proper to reconnoitre it, in order to ascertain whether the facilities would appear to be such as to justify a survey up that ravine.

An experimental route will be run which shall depart from the Baltimore and Ohio rail road near Still house run, and passing through the intervening point of hill, will cross the Patapsco between the head of tide and the Hockley mill dam, making the radius of curvature as great as may be practicable, with a view to passing along the slope of the hill on the west side of the river, in a direction to gain the ravine of Deep run.

This route will have the advantage of a firm foundation for a stone viaduct, nevertheless that a proper comparison may be made in every respect, a route will also be run that shall leave the present rail road at some point that shall appear the most favorable, between the Still house run and Gadsby's run, and intersecting the former route at the most favorable point in a direction to ascend the ravine of Deep run.

It will be proper to select ground that will admit of a location with as little curvature and as moderate inclination as practicable.

With respect to the principles and limits which it is desirable

should govern in these important particulars, I refer you to the accompanying report before recited.

The surveys now directed first to be made, being only experimental and preliminary in their character, it will not be necessary to lay grades upon them, nor to stake out the curvatures as would be done on a line of final location, except, perhaps, along the ravine of Deep run, where, in places, a considerable degree of minuteness may be necessary to avoid erroneous conclusions.

It is believed, that, generally, in making the experimental surveys now contemplated between Baltimore and Washington, it will be sufficient to take the levels of the ground so that profiles may be made that shall approximately represent the surface passed over, without that minuteness which will be required when we come to calculate the precise quantities of excavation and embankment on the line of final location: and that it will not be necessary to plant stakes at equal distances apart, but only at such convenient points as will accord with a sufficient degree of definiteness for an experimental line, and so, at the same time, as to promote a speedy prosecution of these preliminary field operations.

The right line *alignment* [see Sganzin's Civil Engineering chap. 12 and 13] will therefore generally be employed; and it may always be employed in the preliminary surveys of routes where the angles of deflection are small, and where the curve *alignment*, which is so essential in rounding off the angles in rail roads, may not recur very often, or shall not, to a considerable extent, change the quantities of excavation or embankment—but in situations where these quantities will be materially lessened or augmented by completing the curve, as will probably be the case along the ravine of Deep run, it will be necessary to trace and level the curve *alignments*, that is to say, it will require the stakes to be placed at equal distances of 100 feet.

With regard therefore to the character of the alignment to be used, you will consult the necessity of the case, and the economy of the service. But in all cases where the right line alignment is used, it will be necessary to note the quantity and degree of curvature required at each angle, the alignments being the tangents. In making these preliminary surveys, it is contemplated to arrive at *proximate*, rather than *exact*, results; at least with regard to the probable quantity of excavation and embankment on each route. For, in this way, sufficient accuracy in the estimates will generally be obtained to enable us to decide between different routes without loss of time, and the differences are mostly so great as to indicate at once the route to be preferred,

or at furthest, to limit the preference to two, in respect to which a more minute comparison can then be instituted, if necessary.

As the surveys of the several routes advance, you will have respect to the cross profiles of the ground, so that, when the line of grade comes to be laid upon the longitudinal profile drawn upon paper, and the depths of cuttings and fillings shall be thus ascertained, you will be enabled, having regard to the transverse slopes of the surface of the ground, to form a near approximation to the contents of the solid to be removed or supplied, in every instance. Where the work is so moderate as not to require more than 1, 2, 3 or 4 feet depth of cutting or filling, and the transverse slope is gentle, average depths may be assumed that will be near enough for this purpose.

Timbered land will be noted, and also the probable quality of excavations, together with the number and extent of culverts and bridges, and the relative facilities of procuring materials for mason work.

The drawing of the maps and profiles, and the making of the estimates necessary for comparison as aforesaid, must be conducted, in point of time, as the surveys of the several routes advance, in order that decisions may be timely made.

It will frequently happen, however, that several miles together of a route must be levelled over, before a grade line suitable for the ground can be assumed. In such cases the calculations will necessarily be delayed, until the survey shall have sufficiently advanced to indicate the grade to be employed, which in no case is to exceed an ascent or descent greater than 1 in 264, or at the rate of 20 feet per mile.

During the progress of the calculations, tables will be formed containing the distances, curvatures, grades, and quantities of the several routes, and the necessary remarks, by which the relative merits of each will be tested, and a decision made as to the most eligible for the route of the final location.

ORDER OF PROCEEDING.

Conceive the field of examinations and surveys, to the right and left of the base line already described, to be divided into five districts, as follows, to wit:

1st district, the space comprehended between the Balt. & O. R. R. and the top of the ridge between the waters of the Patapsco and Patuxent.

2nd district, extending thence to the ridge between the two branches of the Patuxent.

3d district, comprising the country to be traversed between

the latter named ridge, and the top of the higher grounds which separate the drains of the Patuxent and Potomac.

4th district, from the said dividing grounds to Bladensburgh.

5th district, the remaining space to the line of the city of Washington.

It is recommended that all the preliminary examinations and surveys required within these several districts be performed, in the order of time in which they are here described, beginning with the 1st; and that any exception to this rule of proceeding shall be in consequence of the nature of the case requiring it, such as the re-adjustment of a line, the proving of a level, or the economy of time.

The base line will be run as nearly as may be convenient, or as the ground will suit, on the ground formerly traced out by Dr. Howard for the canal, but a coincidence in this respect is not necessary, and in places will not be expedient, since the canal, in order to procure a supply of water, was made to occupy a lower level than will be proper for the railway. It will perhaps be proper to keep the surveys of this line a little in advance of the other surveys, in order to facilitate the references and intersections with it.

As B. H. Latrobe assisted in the reconnoissance of the route near this line, and is therefore best acquainted with its position, he will take charge of the surveys in relation to it, together with all those which it shall be necessary to make to the right, or upon the N. W. side of that line, whilst my Assistant Engineer, H. J. Ranney will have charge of the execution of all the surveys and levels upon the other side of the same line, with the understanding that where, in any district the allotment of the work as herein assigned to each, proves to be unequal, so that one party shall finish the part of the district assigned to it before the other shall have concluded its part of the same district, the party that has finished, shall assist the other; and generally, a reciprocal aid shall be extended and received, whether as regards surveys, examinations, plans, calculations, drawings, or consultations, as the interest and economy of the service shall require.

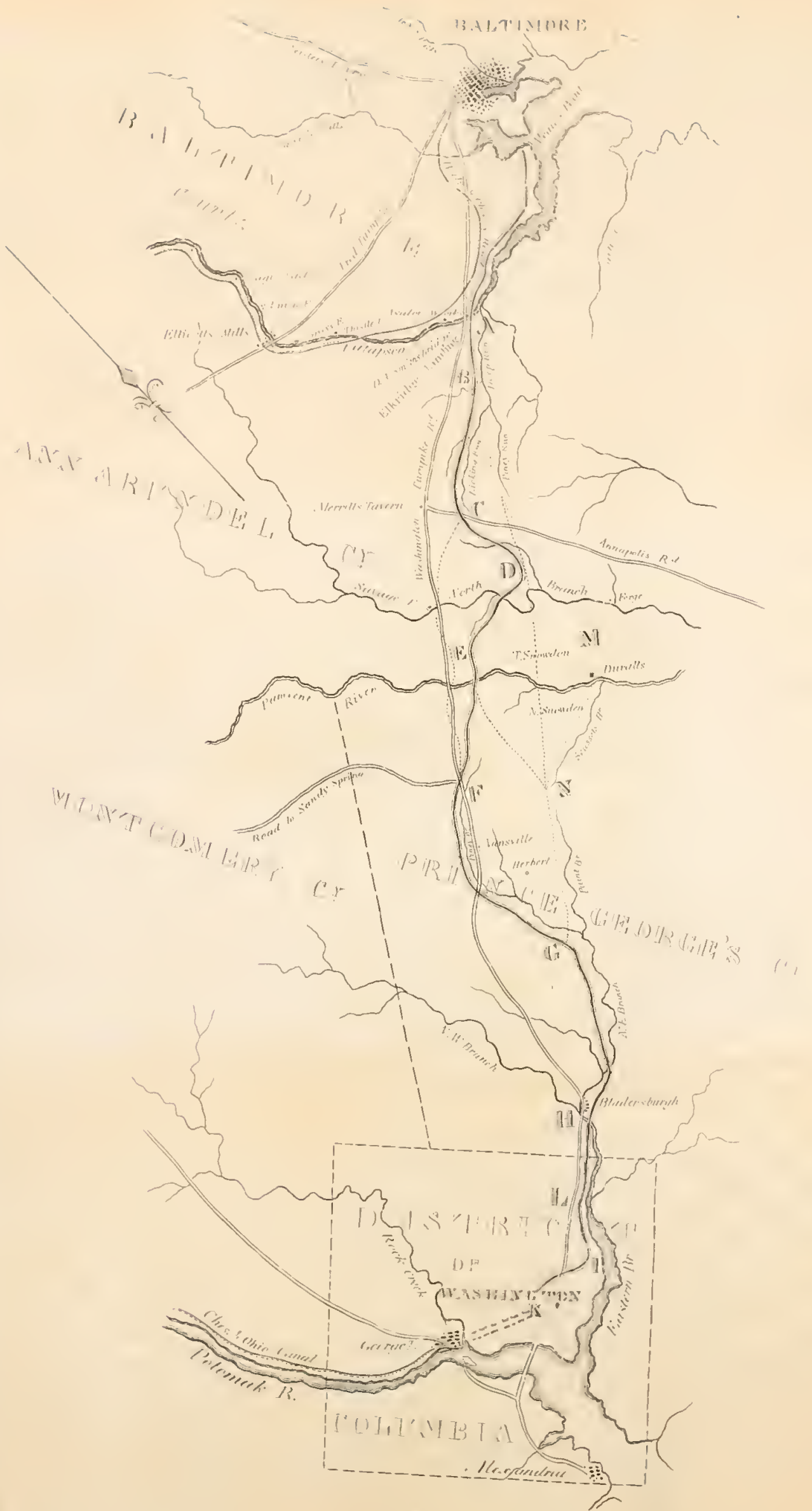
To the end that these beneficial objects shall be attained, it will be advisable that you should, if practicable, board, or encamp together.

It will be necessary, therefore, that each of you shall organize a party capable of carrying on a line of surveys and levels, and the work incident thereto.

Very respectfully,

(Signed in duplicate,)

J. KNIGHT, *Chf. Engr.*



References) ——— Maryland Canal.
) - - - - - Practicable Routes for proposed Rail Road.

Engineers office B. & O. R. R. }
 Baltimore, January 22d, 1831. }

TO PHILIP E. THOMAS, president, &c.

According to thy verbal instructions, and in pursuance of a resolution of the board of directors of the company, I have, in company with my assistant, B. H. Latrobe, made a reconnoissance of the ground between Baltimore and Washington, with a view to the location of a lateral railway from some point on the Baltimore and Ohio rail road, near Elkridge Landing, to the city of Washington.

The route for a canal, as located by Dr. Wm. Howard, and reported by him to the engineer department at Washington, under date of the 25th June, 1827, was regarded as a suitable base to refer to in the examinations.

The following table, extracted from that report, exhibits a summary of the distances and levels of the canal route; beginning at Georgetown and terminating at Baltimore:—

	Distances miles.	No. of locks	Ascent feet	Descent feet.
Georgetown to Bladensburg	- - 9 1-8	2		18
Bladensburg to Summit level,	9 1-2	17	130	
Summit level,	12 7-8			
Summit level to Elkridge Landing,	5 3-8	16		122
Elkridge Landing to Baltimore,	7 7-8	3		24
Total,	44 3-4	38	130	164

Deducting the distance between Georgetown and Washington, and that between Elkridge Landing and Baltimore, the length of the canal route from Elkridge Landing to Washington, will be about thirty-three miles. The length of the turnpike road between the same points is about thirty miles.

I accompany this report with a rough sketch of the country, on a scale of four miles to the inch, which will now be referred to for elucidation. On this sketch, in addition to the notices of the streams, &c. the turnpike road is represented by the line which is made to pass through Bladensburg, and by Vansville

and Merrill's tavern. The canal route is designated by the letters A, B, C, D, E, F, G, H, I, K.

The following table arranged according to the letters, may be extracted from the one preceding:—

	Distance, miles.	Ascent, feet.	Descent, feet.
From A to C, - - -	5 3-8	122	
From C to F, - - -	12 7-8	Summit level	
From F to H, - - -	9 1-2		130
From H to K, - - -	5 1-4	18	
Total,	33		

By the levellings for the canal, it would appear that the ridge dividing the waters of the Patapsco and the Patuxent at C; the ridge dividing the two branches of Patuxent at E; and the ridge dividing the Patuxent from the waters of the Potomac at F;—are all nearly of the same height above tide, to wit, about 200 feet. The summit level for the proposed canal extends from C. to F, and was laid of such altitude as to cross the two branches of Patuxent with aqueducts of moderate height, and to be supplied with water from those streams with short feeders. To accomplish this it became necessary to allow for cutting the ridges at C, E, and F, the respective depths of 64, 74, and 72 feet, and for lengths of about 2 1-8, 1 5-8, and 2 1-2 miles respectively.

The deep and extensive cuts, just mentioned, as being necessary for the contemplated canal,—in order that the same summit level should be expanded to embrace the whole width of the system of land draining into the Patuxent, and so as to ensure a sufficient supply of water for the navigation, which could not have been attained if several summits had been admitted;—need not be executed for a rail road.

It will be perfectly practicable with a view to a rail road, to lay this summit level, from the cut at C, to the cut at F, some 30 to 40 feet higher, by which means the expense of these cuttings would be reduced to an amount which would not, in comparison, be seriously felt, whilst the decreased length of the same would render them easy of drainage.

Cuttings of a depth, probably, from 30 to 40 feet through these ridges cannot be avoided on the route mentioned, nor perhaps on any other route which shall be adopted with a view to the use of the locomotive engines to the exclusion of stationary

power. If an exception shall be found in these remarks, it is barely possible that it may occur in the crossing of the middle ridge at some distance south east from the crossing marked E.

Suppose this summit level to be elevated to the height of 30 feet above that laid for the canal, and that the graduation from C towards A be such as to arrive at A at the elevation of the Baltimore and Ohio rail road in that vicinity, to wit—66 feet above the mean tide; that is, 42 feet above the level of the canal line at A: And suppose the level of the rail road to remain the same as for the canal at H; that is, at Bladensburg; Then, on these hypotheses, the rail road would ascend from A to C, 5 3-8 miles, through a difference of altitude of 110 feet, or at the rate of about 20 1-2 feet per mile—whilst from the other end of the summit level, it would descend from F to H, 9 1-2 miles, through a height of 160 feet, or at the rate of about 17 feet per mile.

In pursuance of this plan, and still to maintain a level line throughout from C to F, it would be necessary, in order to avoid the very high embankments and bridges which a level 30 feet higher than that for the canal would require over the two branches of the Patuxent,—to cross those streams higher up, thereby increasing the length and curvature of the road.

But it would not be necessary, in the location of the rail road, to adhere rigidly to a level line from C to F. It may be made to ascend and descend moderately, and so as to cross the Patuxent at or near to the points intersected by the line for the canal.

Assuming for approximate results, that the hypothetical level for the rail road above mentioned from C to F, is 176 feet above tide, and that the water in each branch of the Patuxent at the place of crossing the same is 120 above the level of tide; it follows that this level line will pass 56 feet above the streams. Now, if we allow 31 feet as the height of the rail road above the streams, it follows that it must descend both ways towards each crossing place, a total of 25 feet in altitude.

This plan would allow of a graduation from C to F which should in no case ascend or descend more than at the rate of 20 feet per mile; and it might be less than this, perhaps not over 10 feet per mile, in all parts, except probably in the descent from E, to the Patuxent, in the direction towards F.

From some suitable point near Elkridge Landing, the route would be conducted across the Patapsco, and be made to intersect the Baltimore and Ohio Rail-road at the most convenient and suitable point with a view to the saving of expense in the construction, and insuring the efficiency of the Road as regards capacity

and power. It is obvious from barely viewing the ground, that a choice of points for the departure of the contemplated lateral Railway from the main stem of the Baltimore and Ohio Railroad presents itself to view; and that the level of 66 feet above tide may be maintained across the Patapsco to some point where it shall be expedient to commence the ascent up the ravine of Deep run towards C. Or, should the ascending line towards C permit, the line may be depressed so as to cross the Patapsco at a lower level than 66 feet above tide. I consider it proper, however, to reserve these points for determination after a full investigation shall have been made, and a knowledge shall have been gained of all the facts and results which the necessary surveys and calculations will develop.

Also, from the vicinity of Bladensburg, the line may be continued at an easy graduation, on the route for the Canal along the right bank of the Eastern Branch of the Potomac to I, and thence through a depression near the toll gate to K, passing along the low grounds north of the Capitol, whence it may enter the City of Washington in such manner as shall be determined to be most conducive to the interests of that city and of the public. Or, the Railway may possibly pass from Bladensburg to Washington by L to K, on the ground more nearly in the vicinity of the route of the Turnpike, and to the right of the range of high hills which border the Eastern Branch. Although this route was impracticable for a Canal, yet since some latitude may be given to the grades of the Railway, it might be made to pass a summit which will be found to exist at about one and a half miles from Bladensburg, and near to the District Line. The altitude of this summit is about 100 feet above tide, which could be overcome at an ascent of 20 feet per mile by cutting 30 feet, and crossing the N. W. branch at 40 feet above the level of the tide. This route would be much the shorter, and probably much less expensive. The preference to be given to one of these routes over the other must, however, depend upon more minute data than could be obtained from a reconnoissance.

THE CHARACTER OF THE ROUTE.

From the foregoing remarks it will appear that the country along the immediate vicinity of the Canal line, as run by Dr. Howard, will afford a good route for a Rail road, and that the graduation may be made without exceeding 20 feet per mile as the limit of ascent or of descent, and that the distance by this route from Elkridge Landing to Washington will be about 33 miles.

For the distance of five miles from A towards C, the route will be mostly on side-lying ground, and must be curved so as in a considerable degree to conform to the slopes. This will be rendered necessary, since the level will be much that of the bed of Deep run in order to obtain a uniform graduation to the top of the ridge at C. This point is about $1\frac{1}{4}$ miles south from Merrill's, and is said to be the lowest pass. The line in its ascent up the valley must cross several ravines, the principal of which are, 1st. Scott's Folly, three-fourths of a mile above the furnace; this drain heads at the turnpike. 2nd. Bud's Run, which is five miles long, crosses the turnpike, and enters Deep Run at the Paper Mill, two miles from the furnace. 3rd. Deep Run itself, which is crossed near its junction with the Licking Branch, from whence the route proceeds up the Licking Run to its head, at the ridge near C. The crossing of these three ravines will require high bridges and deep, but not very long fillings. The dimensions of these works cannot be known until the line shall be run and levelled; yet it is obvious from a view that they will require much labour, and that the route from A to C will be very expensive.

After cutting through the ridge at C, the route passes down a small drain which joins Chandler's Branch, a stream which crosses the turnpike near to Merrill's. The route crosses this branch, and passes on favorable ground lying to the right of it, making considerable southing to the letter D, on the map, in order to avoid very hilly, and apparently impassable ground for a Rail-road, which lies to the right. Having crossed the North Branch of Patuxent, it passes up a small ravine to the top of the ridge at E, where it cuts through at a distance from the turnpike of about one-fourth of a mile. Thence the route descends on sloping ground, crosses the main Patuxent a little distance from the turnpike, and proceeds on favorable ground to the top of Snowden's Ridge, which divides the waters of Patuxent from those of Potomac, at F. Here it cuts through the ridge at a low and favorable pass, and crosses the turnpike to the right of it. Thence it depends on ground apparently quite favorable along Piney Branch to the right of Vansville, and directly recrosses the turnpike to the left of it. It then continues on favorable ground upon the gentle slope of the right bank of that branch to G near its junction with Paint Branch—and thence down the N. E. branch, and crossing the same, proceeds along the left bank to H, at Bladensburg. Here it crosses the Eastern Branch, just below its junction with the N. W. branch, and thence continues down the right bank of the same to I, and

thence to K, as before mentioned. This route from H to K, is unfavorable by reason of extensive low grounds, which will require embankments, and of very steep side-lying ground in the narrows at I. This part of the route though unfavorable, is entirely practicable. It will require strict and minute examinations to determine if it may not be avoided and a passage found by L, as herein before proposed. These examinations should be extended even north west of Bladensburg for a short distance, and perhaps as far back on the line as to G.

The least expensive part of the line will be that from F to H.

The line passes through a considerable quantity of timbered land in places, but the cultivated grounds predominate. It lies below the base of the granite range, and hence stone and rock do not prevail. Rock may not be expected to be encountered in the excavation, which will consist of earth, sand and gravel, mixed—and probably, in places, indurated clay. The ground in many parts has the appearance of that between Baltimore and Elkridge Landing, yet in other parts it is rather more even and fertile, and in many places seems to contain more gravel. Sufficient stone may be had, within moderate distances, for rubble masonry; but stone suitable for any other description of work, is not visible any where on or near to the line. The character and extent of the walls and bridges which may be required, should be determined upon the principles of a judicious economy, having due regard to every circumstances calculated to effect the decisions. But those circumstances cannot be fully known until the lines shall have been located.

OTHER GROUND TO BE EXAMINED.

Having determined the character and entire practicability of the route A, B, C, D, E, F, G, H, I, K, for the proposed lateral Rail-road, and having mentioned the route by L as one which should be examined with a view to an improvement of the line, the following routes are presented as worthy of examination also.

1. A route from B to D passing up the Piney Run branch of Deep Run, and crossing the ridge at some favorable depression in a direction towards D, and thence passing down a small branch to Chandler's branch, and thence crossing the same and intersecting at D. It is proposed to examine this route with a view of shortening the distance. And possibly, should the ravine of Piney Run be preferred to that of the Licking, it might result that it would be better to cross Deep Run below the

mouth of Bud's Run, or even before Scott's Folly, in order to dispense with the crossings of them.

2. A route B, M, N, G. This would pass up the Licking, and either cross the ridge on the route from B to D just mentioned, or otherwise at some point south east from it; thence down on favorable ground on the south east side of Chandler's branch, crossing the north branch of Patuxent at——'s old mill; thence on favorable ground along the eastern slope of the ridge dividing the two Patuxents, crossing the said ridge near the school-house, where there is a very low depression, designated on the map by the letter M; thence descending on favorable ground and crossing the main branch of Patuxent near to Duvall's mill; thence ascending up Scasset's or Cash's branch to a depression in the summit of the ridge at N, which divides the waters of Patuxent from those of the Potomac. This depression is on the farm of Zelic Duvall, and is stated in the report of Dr. Howard to be 15 or 16 feet lower than the depression at F, on the canal route. N is about $4\frac{1}{2}$ miles distant from F. From N the route will proceed down the Paint branch, and intersect the other route at G.

3. A direct route from D to N. This route would be very important in connexion with the direct route from B to D. For if these should be found to succeed, the location could be made almost straight from B to G, and the rail-road would be as short as the present turnpike.

4. A route E, N, G, which would have the advantage in grade arising from the high crossing of the Patuxent between E, and F, and of the low depression of the ridge at N.

5. A route from C to F, which shall cross the north branch of the Patuxent at, or near, the Savage Factory; thence across the ridge, at, or in the vicinity of E; thence across the principal branch of the Patuxent near to the turnpike; perhaps to the right of it and thence to the depression of the ridge at F.

This line would encounter rough ground through part of the space between C and the Savage Factory; but, should it be found practicable, it would secure the shortest and the most level route from C to F. It may also be remarked that the great fall in the stream near the Factory and the high banks which bound the other stream at the place which it is here proposed to be passed, it is probable, would admit this route to be a perfect level, or very nearly so, from C to F.

6. In addition to the lines examined, and to those here suggested, the intermediate ground between them, as well as ground to the right and left of any of them, should be so far examined as

to avoid the possibility of erring in the selection of the best route which the country can afford for a work of such importance.

Several of the routes here suggested were by me examined in whole or in part, and the reconnoissance would have been extended to all of them, had not the recent great fall of snow rendered it impracticable.

CHARACTER OF THIS RAILWAY.

While this railway is *lateral* as respects the Baltimore and Ohio rail road, yet, in its operation, it will be national, both from the circumstance of its leading directly to and from the capitol of the Union, as well as in consequence of its connecting that capital immediately with the city of Baltimore, and through that city, effectively, with the cities of Philadelphia, New York and Boston, as well as the seat of government of Pennsylvania, and all parts and places from the North West to the North East.

It will also form an important link in the great chain of inland communication parallel to the sea coast, and as such will connect in interest and intercourse, the South and South West, with the North and North East.

This road having evidently the high character here given to it, it will be incumbent on those into whose hands it may be committed to lay the plan for its construction so that the functions of such a highway shall be capable of a developement to the extent not only now demanded, but which may be required for the accommodation of this growing community in time to come.

GENERAL REMARKS.

It will be impossible that this railway shall have the necessary capabilities unless the graduation shall be made to depart but slightly from a level.

We have seen that the country will afford a graduation that shall not exceed an ascent or descent greater than twenty feet to the mile, or of 1 in 264.

The railway should not be made of a steeper grade than the limit just mentioned, otherwise high velocities cannot be maintained.

For the same reason the curvatures should be as slight as circumstances will admit.

From the Patapsco to Washington it is probable that the radius of curvature may be adopted so as in no instance to be less than 1000 to 1500 feet, and it is believed there will be few places where it need be less than 3000 feet. There are but few curvatures between Baltimore and the Patapsco having a less radius than 1000 feet.

The graduation and curvatures of the proposed branch to Washington should not be governed by those which it was necessary and expedient to make on the Baltimore and Ohio rail road. For since separate engines and machinery may be made to ply upon the branch, the plan and profile of it should be as favorable as the country through which the route must pass, will admit.

Ascents or descents so great as twenty feet to the mile should not be adopted, unless that to avoid them would cause too much curvature, or too great expense.

If practicable, this railway should be so made as to admit light locomotives to run from the Patapsco to Washington within the time of one hour and a half;—half an hour might be consumed in running from Baltimore to the Patapsco, and the whole trip from Baltimore to Washington would be regularly made in two hours.

This rate of motion has been maintained, and much surpassed on the Liverpool and Manchester railway. And supposing the curvatures and graduation which we may be compelled to adopt shall only permit of about one-half the highest velocity at which a locomotive engine has sped from Liverpool to Manchester, still it is possible that a message may be made to pass the whole distance from Washington to Baltimore in one hour.

Within the last two years, and since the commencement of the Baltimore and Ohio rail road, the efficiency of railways has been doubled or trebled by improvements which have been made in the machinery intended to move upon them. The locomotive engine has been improved so as to move with quadruple the velocity it had attained before, whilst the various inventions and modifications made in the construction of cars, their wheels, boxes, journals, and oiling, have reduced the friction to one-half what it was two years ago with the very best English rail road car. At the same time the durability of the wheels and rubbing parts has been in like manner improved. With all these facts before us, it cannot be doubted that under very favorable circumstances, such as I hope will be found to obtain on the route now under consideration, an average velocity of twenty miles per hour will be established.

The improvements in the Winans car have slowly, yet regularly advanced within the preceding few months. The ingenious inventor has been making silent and sure advances in the form and consistency of the parts liable to break or to wear, and in the methods of oiling and of preventing the access of dust or other injurious substance to the rubbing parts. The texture of the friction wheel and of the axle may be considered to have attained to the perfection desired. The wheels which roll upon the rails, and which are common to this and the other cars, have also been perfected, possibly, to the extent of which they are capable.

These improvements reduce the friction from 1-200 to 1-400, and the improved Winans car will, therefore, be in equilibrio with gravity on a descent of 1 in 400, which is at the rate of 13 2-10 feet per mile: or, allowing for imperfections of road or otherwise, to the amount of $12\frac{1}{2}$ per cent, then the descent would be 15 feet per mile, whilst a traction of one pound would draw 350 pounds, or 7 pounds would draw a ton on a level; and the working effort of a horse would draw 18 tons, 2 and a half miles per hour. A locomotive engine of the weight of $3\frac{1}{2}$ tons, working with the adhesion of only two wheels, would, in the most unfavorable state of the rails for slipping, draw after it upon a level 28 tons, or 9 cars and 200 passengers; and it would draw 4 cars and 100 passengers up an ascent of 15 feet per mile. When the rails were in a favorable state, the draught would be double or even treble of the above.

The foregoing remarks are made to show the efficiency of the Winans car on a level railway, or on one very slightly inclined. At the same time they afford important illustrations of the principles which should be consulted in constructing the proposed railway, so far as they demonstrate how great is the amount of tonnage which a light locomotive engine will be capable of drawing when the Winans car shall be used.

It follows that these cars should be used on the railway from Baltimore to Washington, since the friction is so small, that a locomotive whose construction shall be as light as can well be made, would accomplish all that the most sanguine can desire.

The plan of the road has not yet been sufficiently matured, nor have the examinations been of a character so minute, as to enable me at this time to present an estimate of the probable expense of construction which could be relied on.

J. KNIGHT, *Chief Engineer.*

(G.)

Engineers Office, B. & O. R. R. }
Sept. 30, 1831. }

To J. KNIGHT, *Chief Engineer.*

THE construction of the machinery connected with the moving power upon the railway, committed to my charge, has been carried to the extent required, and consistently with its faithful and advantageous execution; and various improvements have been made in the forms and proportions, as well as in the texture of the parts liable to breaking or wearing.

The improved turn-out which was adopted last year, and adapted to in my last annual communication, has been found to answer the end for which it was designed.

This improvement was effected by employing only one switch instead of two, as previously used; and by placing this one in the interior rail of the turnout, which, when thrown open to a certain limited extent, formed a groove through the rail of the direct track: through this groove, the flange of the wheel is directed by the switch, whilst the change in direction of the motion of the carriage is also aided by means of the flange of the opposite wheel rolling upon a *hard* cast iron plate.

During the last year, the castings and switches of these turnouts have been modified in their dimensions so as to permit of the same width of track at the turnouts as in other parts of the railway, to wit, 4 feet 9 $\frac{1}{4}$ inches, and so that the play of 1 $\frac{3}{4}$ inches for the flanges would be uniform throughout the road. This required the castings and switches to be increased in length to 5 feet, and is found to be an improvement; the cars passing through these turnouts with facility, and without danger from accidents.

Such modifications also in the wheels and axles, as experience indicated to be necessary, have been attended to according to instructions, and these parts have been increased in weight and durability.

Many experiments have been made with regard to the chilling of wheels, several of which resulted favourably; and good wheels are now made.

An attempt has been made to ascertain the practicability of increasing the strength of the wheel without adding to its weight, by casting it with an interior flange attached to the rim on the side opposite to the exterior flange; this experiment promises success.

The diameter of the journal of the axle which revolves in the chilled box, is 2 inches—and from the circumstance that no appearances of failure have been observed after twelve months use, it is believed that a diameter of 1 $\frac{3}{4}$ inches may be employed to advantage.

The chilled cast iron box and the steeled journal, work well together, and are very durable; and no apprehension is entertained from a want of strength, or of rubbing surface, in case of the reduction in size as proposed.

Various experiments having shewn the decided advantage possessed in the friction wheel car over the present chilled box car, in passing through the curves of the railway, in consequence of the vibrations of the axles of the former, permitting a more full effect to the action of the cone; an attempt has been made to extend that principle to the latter. A car has accordingly been fitted

up in such a manner as to admit the box to move through short distances as the axles should vary from their parallelism. This car moves through the curves with much increased facility, but sufficient experiments have not been made to ascertain with precision its relative merits.

The turnout and curved way at Ellicotts' Mills, directed to be laid down with a radius of 60 feet, intended to be traversed by the action of the wheel rolling on its flange, has just been completed, and experiments with two loaded carriages have been made to ascertain the traction required in this curve. The result is, that the traction was the $\frac{1}{49}$ with the Winans car and $\frac{1}{5}$ with the chilled box car.

It may be remarked that the near approach to equality of force required for each of the two carriages in this experiment, arises from the resistance in either car, being principally at the flanges of the wheels, the curvature being too great to be accommodated by the extent of vibration allowed in the axles of the friction wheel car. In passing a curve of 60 feet radius under these circumstances, the advantage of the Winans car over the chilled box car, in lessening the resistance at the journals, is therefore diminished by as much as the resistance is augmented at the flanges. Respectfully,

J. ELGAR, *Asst. Engr. Mach.*

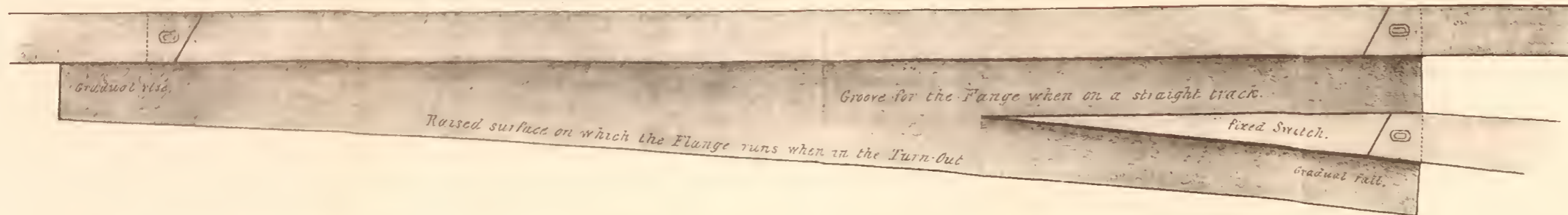
(H.)

Estimates of the probable expenditures of the Baltimore and Ohio rail road company, during the ensuing twelve months, for the following mentioned purposes, viz :

The completion of the graduation, masonry, and bridging on the main line to the Point of Rocks, and on the lateral road to Frederick,	\$ 90,000
The completion of two tracks of railway to the Point of Rocks, and of a single track to Frederick, together with the necessary depots,	445,789
The erection of the requisite stationary, machinery, and fixtures on the inclined planes at Parr's ridge,	40,000
The continuation of the railway within the improved parts of the city of Baltimore,	12,500
The construction of the necessary cars and locomotive engines,	150,000
The location of the route of the Washington railway,	5,000
Contingencies,	56,711
	<hr/>
	\$800,000

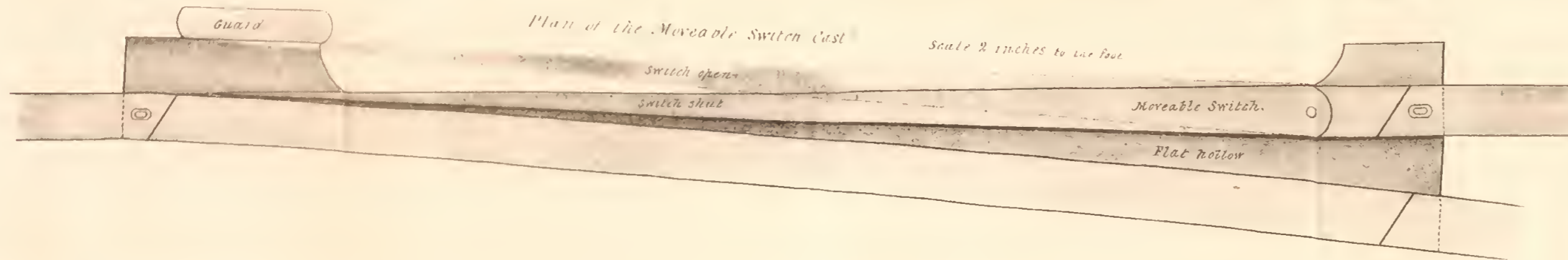
Plan of the Fixed Switch Casting

Scale 2 inches to a foot



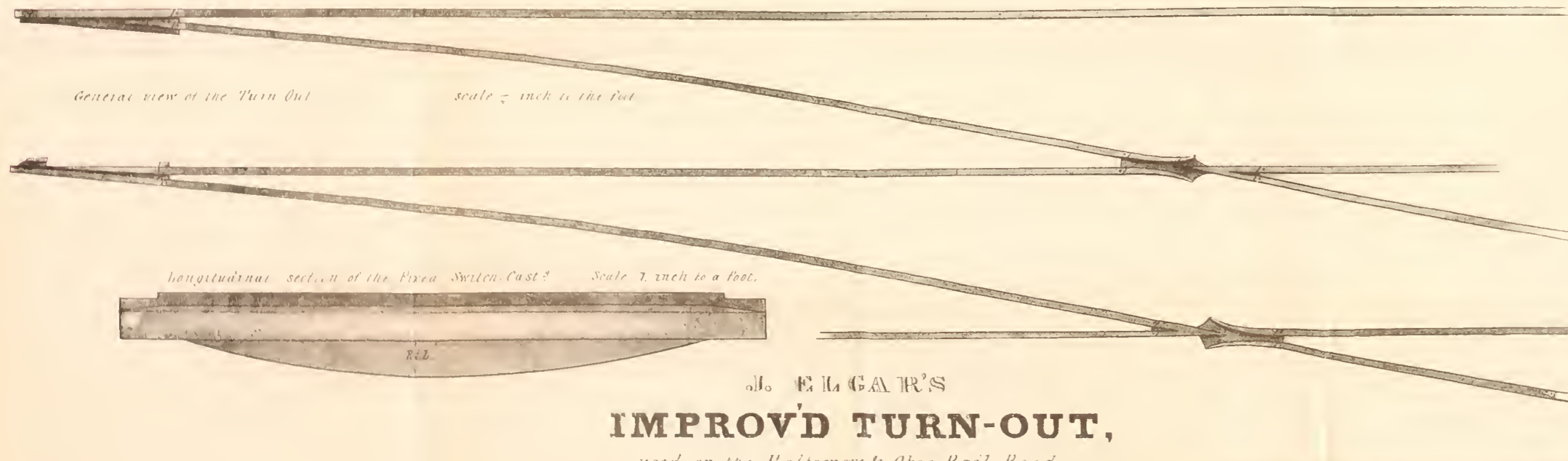
Plan of the Moveable Switch Cast

Scale 2 inches to the foot



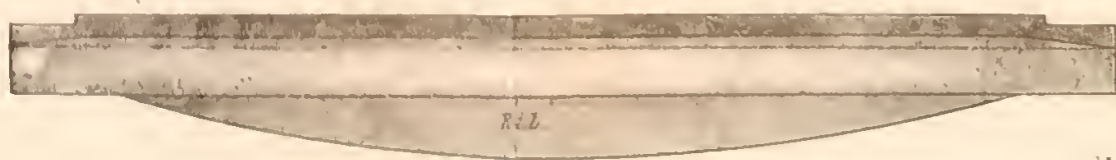
General view of the Turn Out

Scale $\frac{1}{4}$ inch to the foot



Longitudinal section of the Fixed Switch Cast

Scale 1 inch to a foot

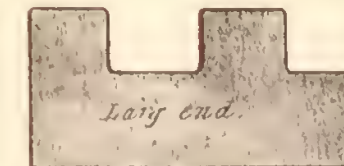
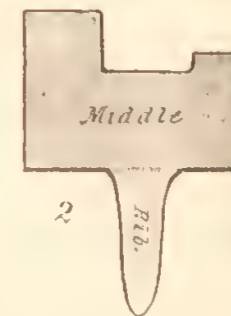


Gross Sections of Moveable Switch Cast

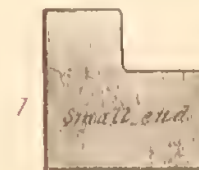
Scale 2 inch to a foot



Fixed Switch Cast



Moveable



Fixed

J. E. GARR'S IMPROV'D TURN-OUT,

used on the Baltimore & Ohio Rail Road.

Lith of Fairbairn & Swett.

Main Track

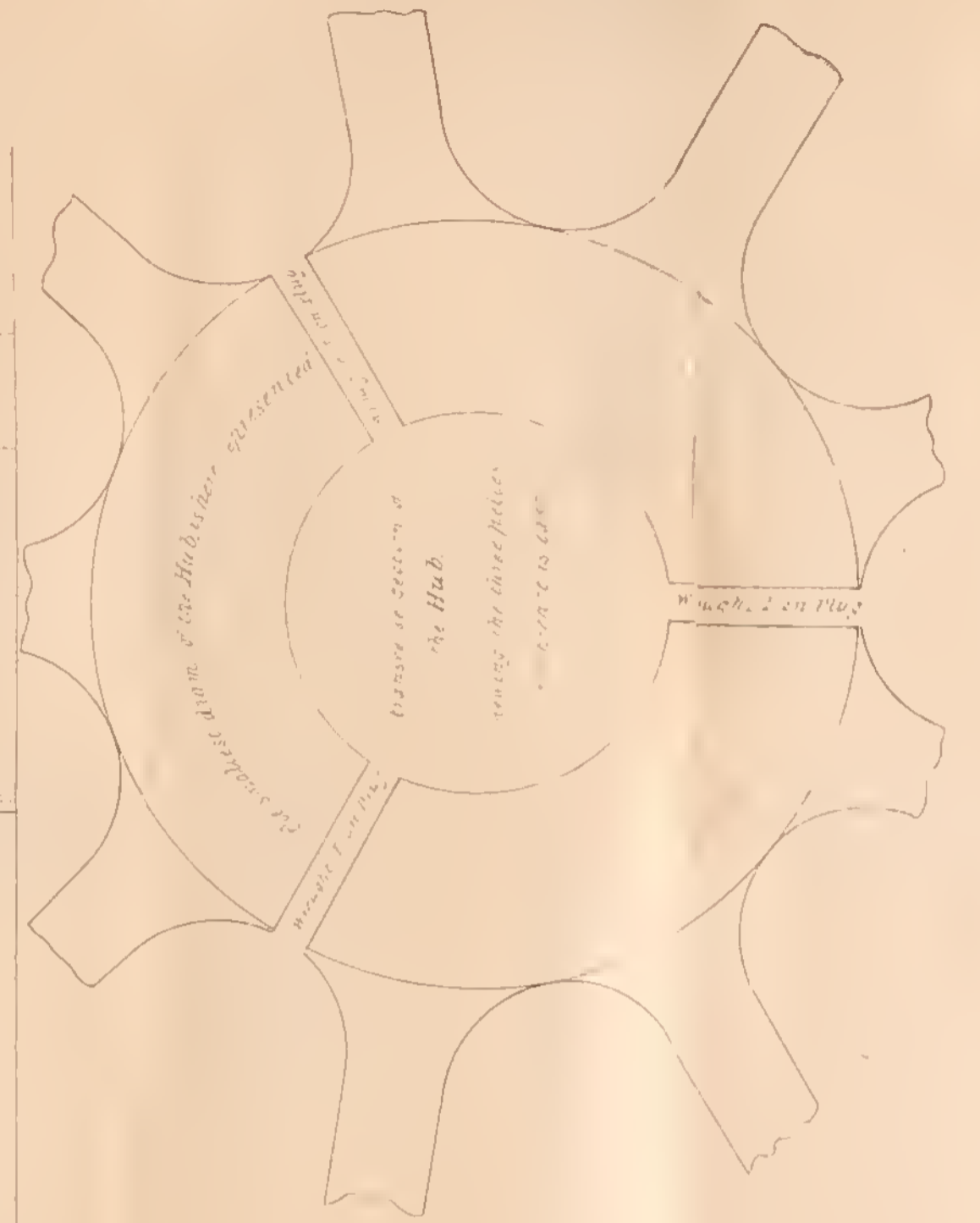
Full size Drawings of the Chilled Cast Iron Wheel,
used on the Balto. & Ohio R. R.

Inside of the Spoke

Outside of the Spoke

Longitudinal section of the Spoke

largest diam. in Hub
smallest diam. in Hub

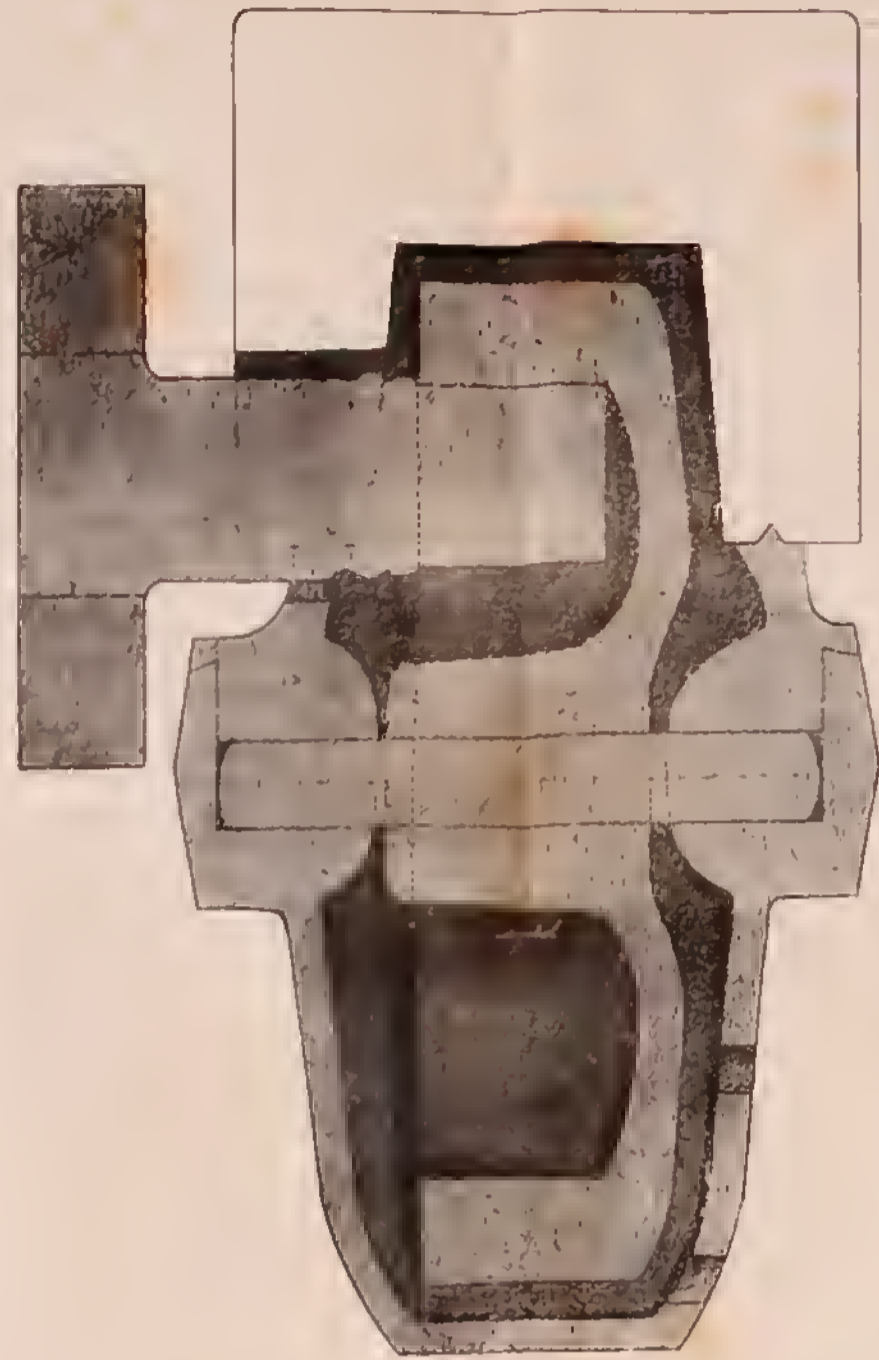


Note: In the longitudinal section, the dotted lines are used to render this part of the drawing a reference to the casting as the case itself.

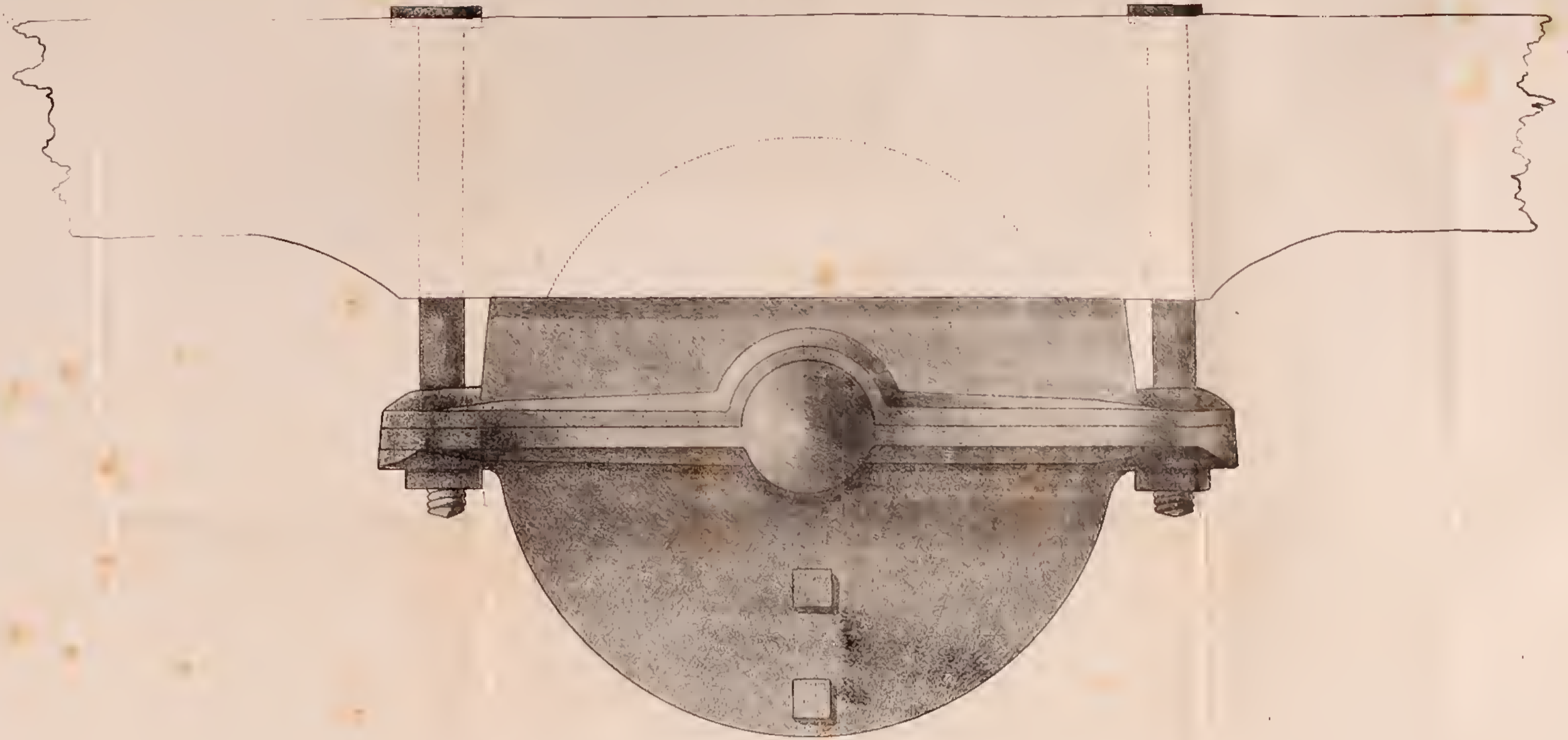
the AXLES of the Wheel Scale 2 inches to a foot

Wm. A. F. & Sons

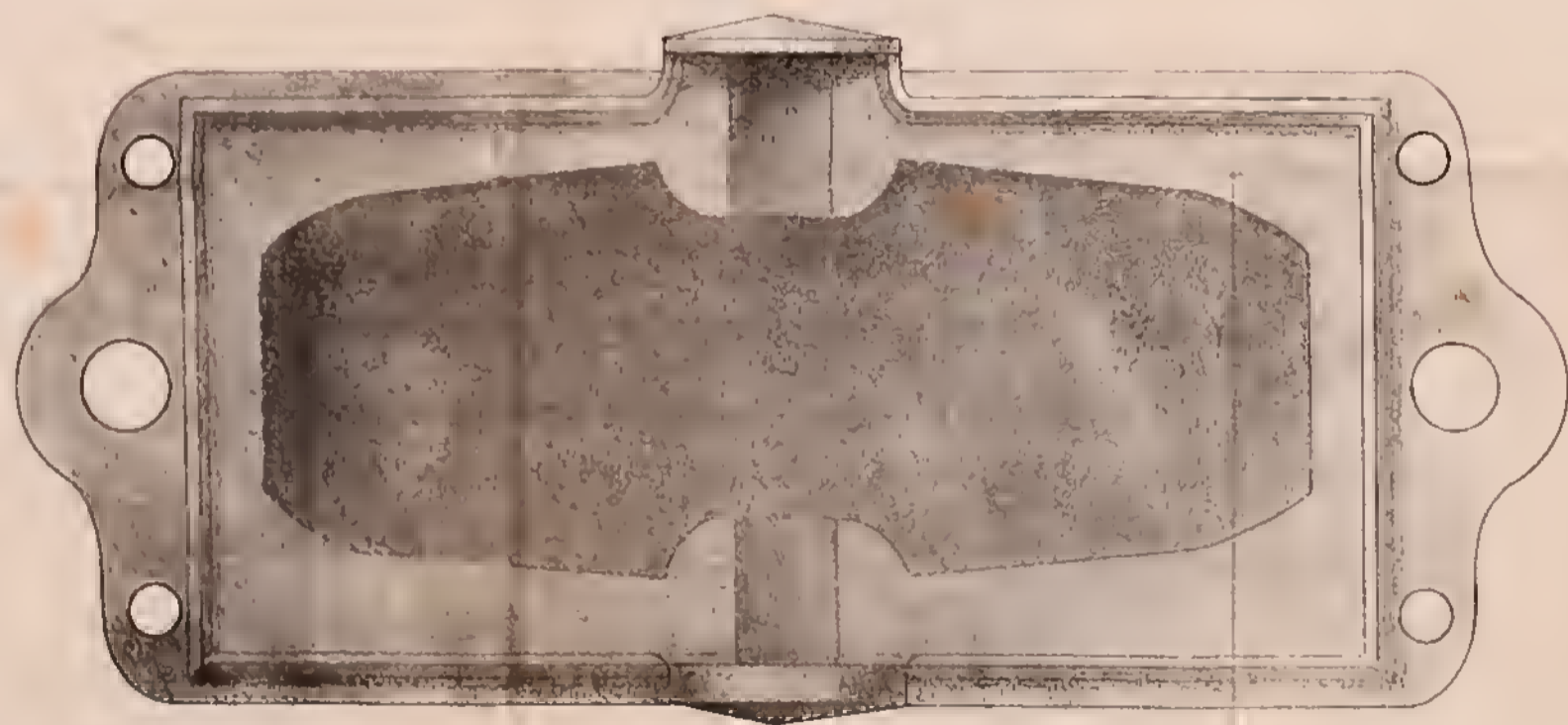
Vertical section of the Friction Wheel & Box, in connection with the Main Axle & side piece.



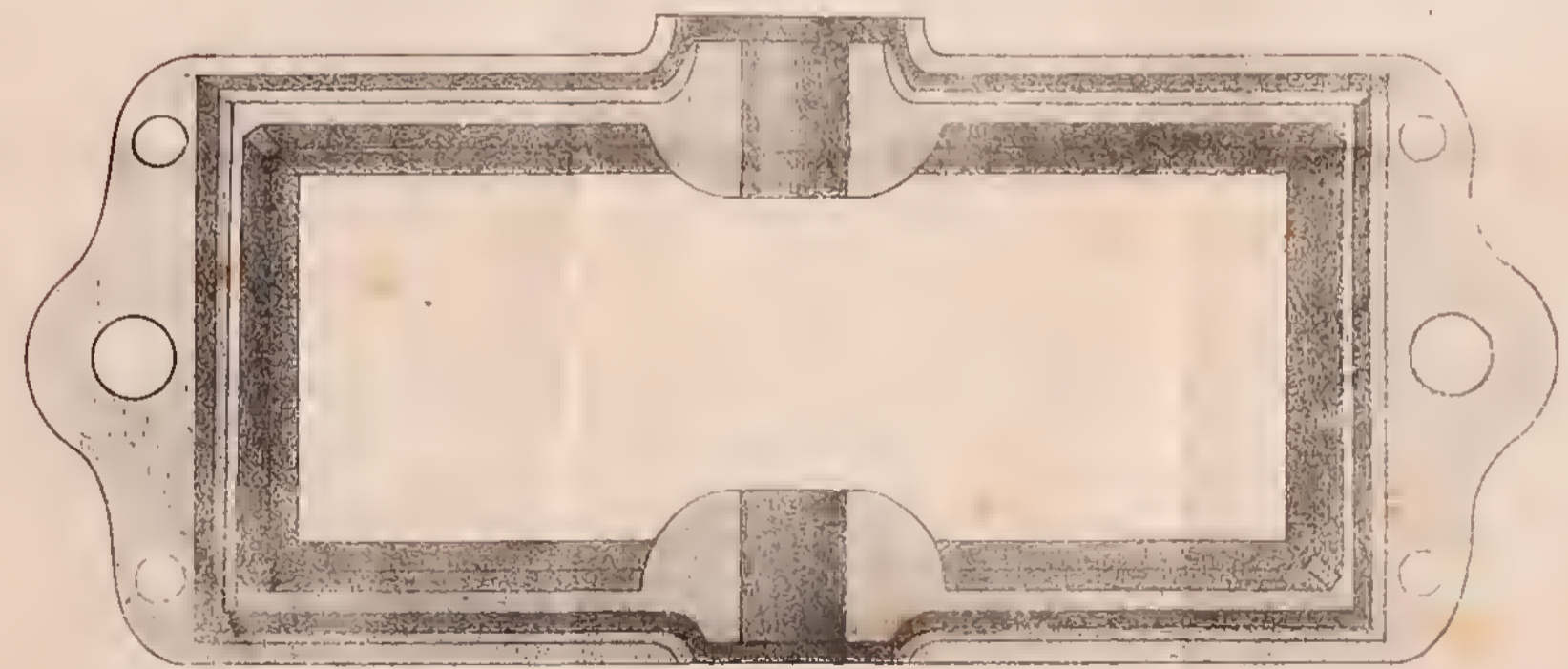
Lateral view of the Friction Wheel Box as attached to the side piece of the Car Frame.



Plan of the lower division of the Friction Wheel Box.



Plan of the upper division of the Friction Wheel Box.

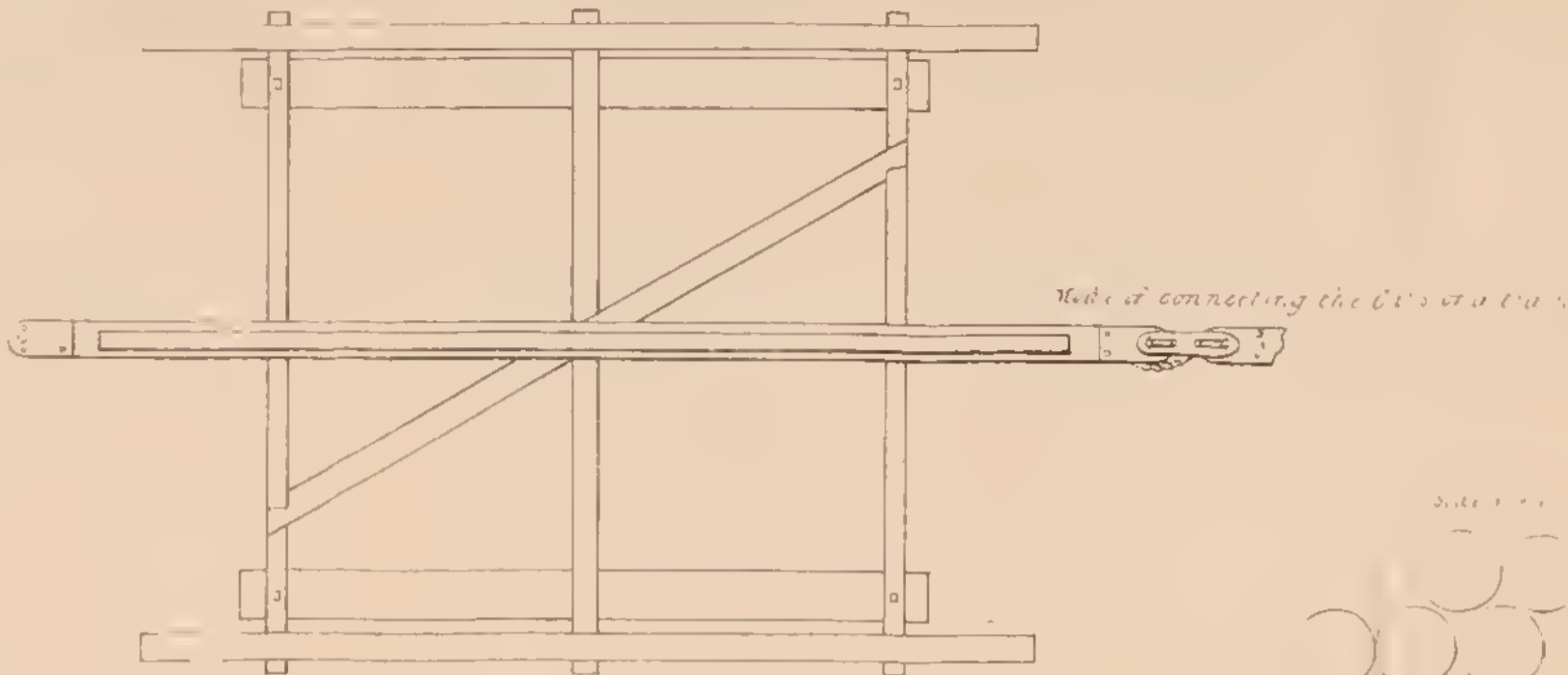


HALF SIZE DRAWINGS
OF THE
FRICTION WHEEL
OF
ROSS WINANS

*as improved by himself and used on the Baltimore & Ohio Rail Road.
Lith. of Enacell & Swift.*

PLAN of the FRAME on which the CAR-BODY rests

Scale 1/2 Inch to the foot



End View



Mode of joining Barrels in a Car.

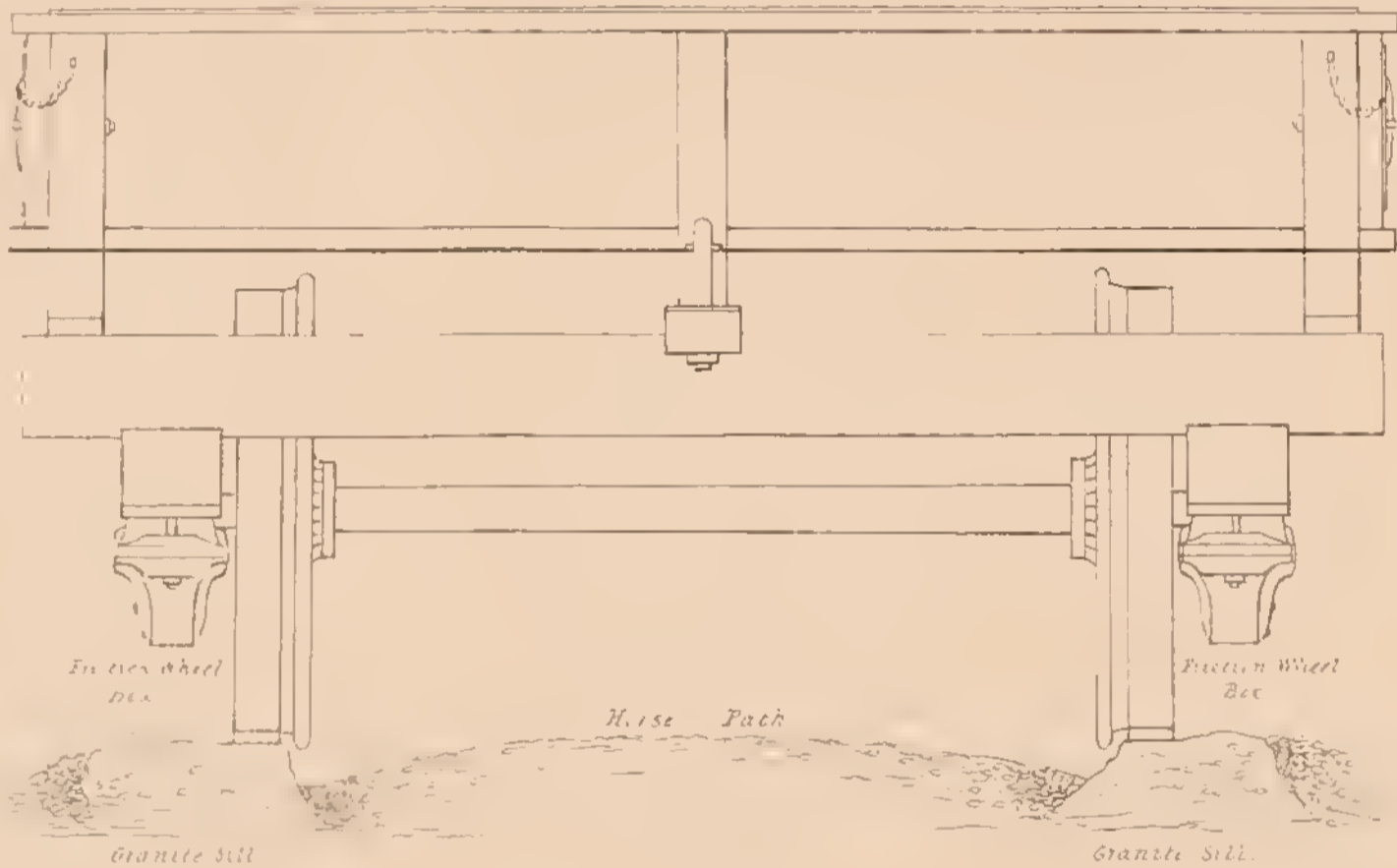
Side View



Mode of joining Barrels in a Car.

END VIEW of the CAR.

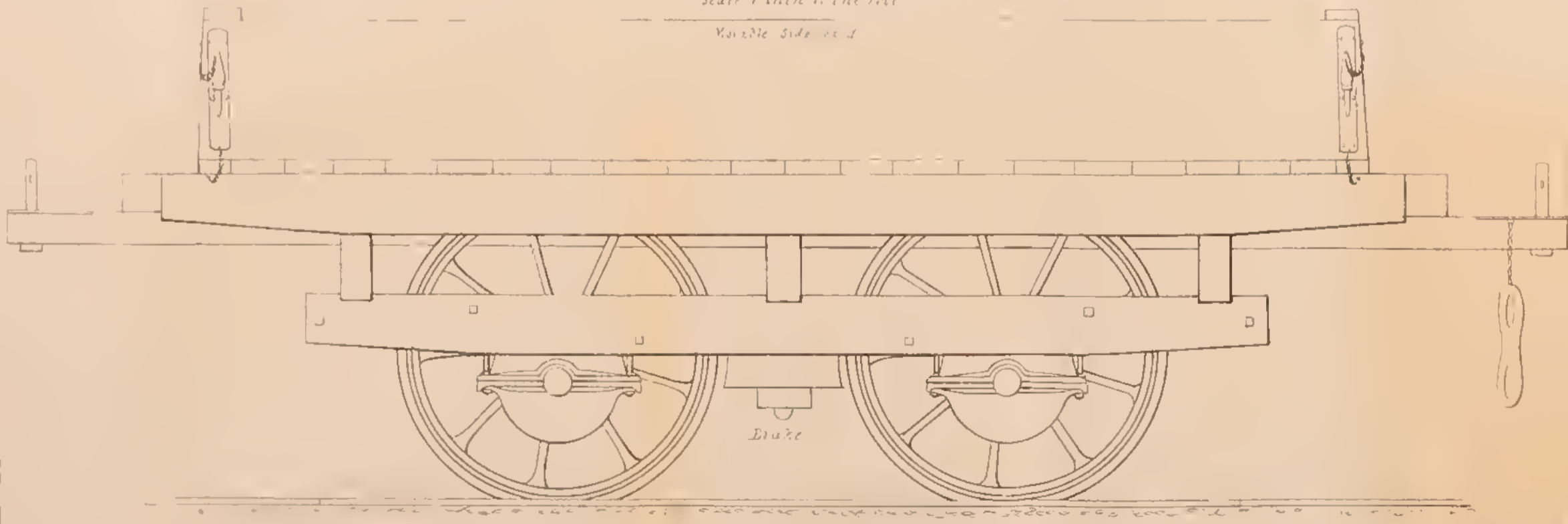
Scale 1 inch to the foot



SIDE VIEW of the CAR.

Scale 1 inch to the foot

Variable Side View



C A R

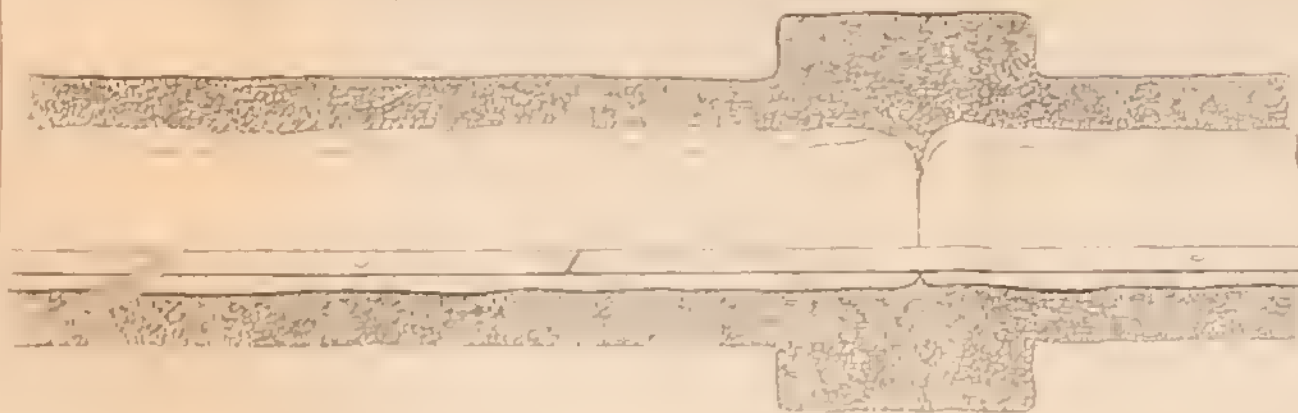
USED FOR the TRANSPORTATION OF

FLOUR

OF THE BALTIMORE AND OHIO RAIL-ROAD.

DESIGNED BY A. W. W. W.

Plan of a portion of the track *etc*



this side the dotted line shows the size and dimensions of the trench and bed of the
same in which the Sill Rests are exhibited

on this side the track is represented as finished



Side view of the interior of a line of Sills



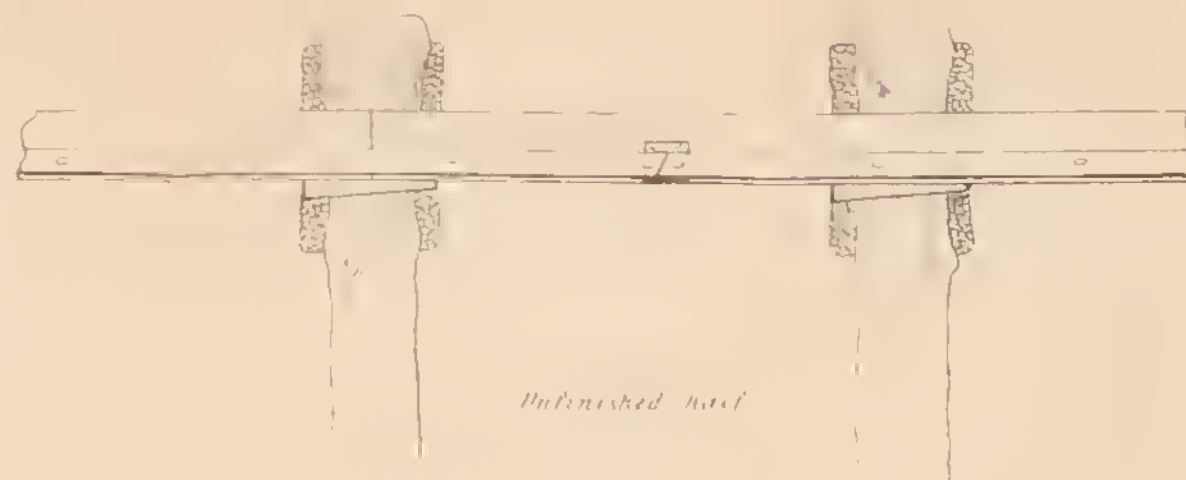
space for the horse path.

Cross section of the track



Stone Sill

Plan &c

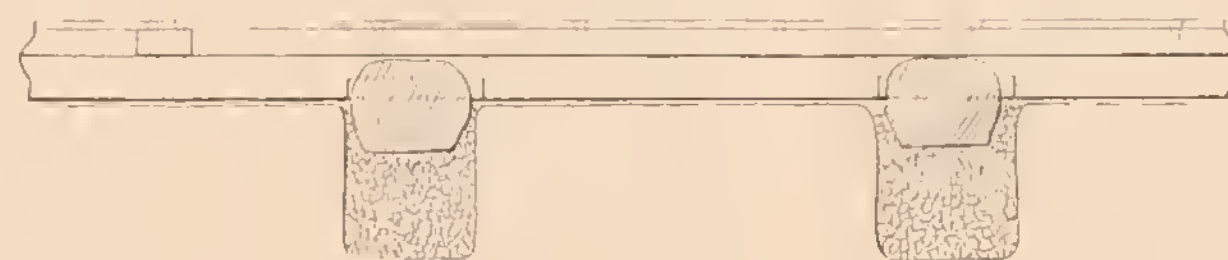


Unfinished track

Finished track



Side View &c.

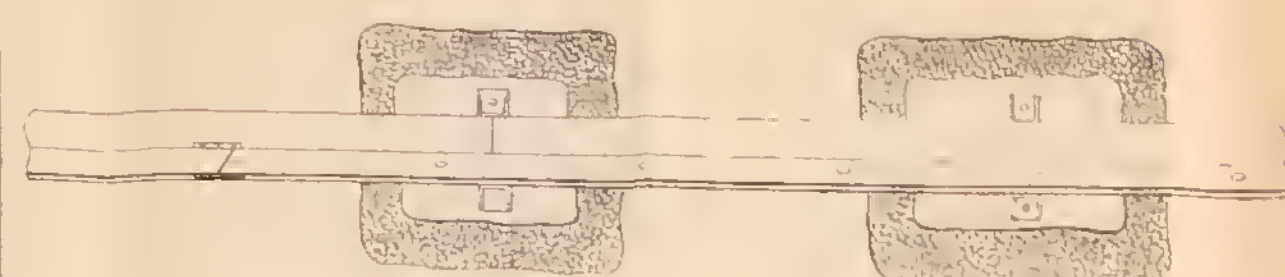


Cross section &c



Wooden Sill Rests and Sleepers

Plan &c



Unfinished track

Finished track



Side View &c



Cross Section &c



Wooden Sill Rests & Stone Blocks

DRAWN BY G.S. illustrating the various modes of constructing & laying down a RAILWAY as mounted & used by B & O R Co. adjacent sections of their Road.

Scale 1 inch to the foot

SECOND ANNUAL REPORT

OF THE

Superintendent of Graduation and Masonry.

Frederick, Md., Oct. 1, 1831.

TO PHILIP E. THOMAS, ESQUIRE,
*President of the Baltimore and Ohio
Rail Road Company.*

SIR,

In compliance with the regulations of the company, I submit my second annual report upon the progress and present condition of the graduation and masonry of the Baltimore and Ohio rail road.

City, First and Second Divisions.

At the date of my first annual report, the city and first and second divisions of the road were finished, with the exception of the 26th section of the first, and the first section of the second divisions. Statements were then rendered exhibiting the actual cost of the sections completed, and an estimate of the two sections at that time unfinished.

The city division commences at Pratt street, and ends at the "first stone," or S. W. boundary of the city of Baltimore;—The first division begins at the termination of the city division and ends at a point on the northern edge of the Frederick turnpike road, at Ellicotts' Mills. These two divisions embrace a distance of 13 miles and $22\frac{7}{10}$ poles. Their cost for graduation alone has been \$381,599 $27\frac{1}{2}$, or per pole \$91 $23\frac{1}{10}$, being equal to \$29,193 92 per mile. Their cost for masonry alone has been \$224,313 $31\frac{1}{2}$, or per pole of road \$53 $62\frac{7}{10}$, and per mile \$17,160 64 : And the cost for graduation and masonry together \$605,912 59 , or per pole, \$144 $85\frac{8}{10}$, and per mile, \$46,354 56 .

On those divisions, several very large bridges, some smaller ones and a great number of culverts, were built, containing together $47,300\frac{1}{2}$ perches of masonry, at an average cost of \$4. $\frac{7}{10}$ a perch of 25 cubic feet. A particular description of those structures may be found in my last annual report. It is satisfactory to be able now to state that they have all stood the test of time, al-

though they were constructed with unusual rapidity, and some of them were hastily loaded with embankments rising above the apex of their arches, from 20 to upwards of 30 feet in height.

The second division commences at Ellicotts' Mills and ends at the Forks of the Patapsco river, comprising a distance of 11 miles and $219\frac{9}{100}$ poles. Its cost for graduation alone has been \$89,447 $7\frac{1}{2}$, or per pole \$23 $91\frac{7}{10}$, and per mile \$7,653 44 , and for masonry alone \$28,880 $4\frac{1}{2}$, or per pole \$7 $72\frac{2}{10}$, and per mile \$2,471 04 . Its cost for graduation and masonry together has been \$118,327 12 , or per pole \$31 $63\frac{9}{10}$, and per mile \$10,124 48 .

The bridges and culverts built upon this division contain 9,837 $\frac{1}{2}$ perches, and cost \$2 $93\frac{1}{2}$ a perch.

Third Division.

This division begins at the Forks of the Patapsco and terminates on the summit of Parr's ridge. It is divided into 41 sections. The first 35 sections were commenced in August and September, 1830, immediately previous to the date of my last report. An estimate was then reported of their expected cost for graduation and masonry, amounting to the sum of \$110,020 97 . They have all been finished and their actual cost has been \$99,712 58 , being \$10,308 39 less than the estimate.

The remaining six sections were only placed under contract in the month of June last, and the work was not generally commenced until about the middle of July. On these sections are the inclined planes Nos. 1 and 2, the graduation of which is heavy. It is however expected that they will be finished by the 20th of this month. The masonry on them will be completed by that time, with the exception of the stone viaduct across the Frederick turnpike road, which was begun only a few days since, it having been previously intended to pass the railway over that road on a wooden structure. This viaduct will be so far completed by the 1st of November, as to offer no impediment to the laying down of the rails.

Tables M and N show the actual and estimated cost of the various sections of this division, both for graduation and masonry,—the lengths of the sections,—the quantum and description of the masonry on each, &c. The length of the division is shown to be 17 miles and $104\frac{29}{100}$ poles, and its actual and estimated cost for graduation alone is \$103,518 55 , or per pole \$20 $38\frac{4}{10}$ and per mile \$6,523 20 ,—for masonry alone \$19,171 08 , or per pole \$3 $45\frac{7}{10}$ and per mile \$1,106 24 : And for graduation and masonry together, \$132,196 28 , or per pole \$23 $84\frac{2}{10}$, and per mile \$7,629 44 .

Table N, shows that the quantity of masonry built and to be built in common culverts and detached walls, is estimated at 4,465 $\frac{3}{4}$ perches, at a cost of \$6,357 39 $\frac{1}{4}$, or per perch \$1 42 $\frac{3}{10}$.

That the masonry already constructed and to be constructed in bridges, is estimated at 3,438 perches at a cost of \$12,813 68 $\frac{3}{4}$, or per perch \$3 72 $\frac{7}{10}$.

That the masonry of every description on this division will amount to 7,903 $\frac{3}{4}$ perches, and will cost \$19,171 08, or per perch \$2 42 $\frac{1}{2}$.

On this division there are four bridges and one viaduct; the chords of the arches of these bridges are respectively, 12—40—20 and 25 feet, and that of the viaduct 20 feet.

Fourth Division.

This division begins on the summit of Parr's ridge, 42 miles and 26 $\frac{9}{10}$ poles from Pratt street, Baltimore, and terminates on the west bank of the Monocacy river. It pursues the ravine of Bush creek, on the south side of that stream for about 4 $\frac{1}{2}$ miles, when it crosses to the north side over a stone bridge of one arch of 25 feet chord. Thence it traverses the north side of the stream to its confluence with the Monocacy, over which river it passes upon a bridge of three hundred and fifty feet in length. This division is divided into 26 sections.

The last or western ten sections, were commenced in December, 1830. Those sections are all finished and the rails laid upon them, excepting a few hundred feet, embracing a hard rocky cut of forty feet in depth. It is believed, that this short piece will be prepared for the reception of the rails, in the course of fifteen or twenty days. An estimate of the cost of those ten sections was furnished in January last, for graduation and masonry, amounting to the sum of \$47,183,70. It is now ascertained, that their cost cannot exceed the sum of \$45,375,70, being \$1,808 less than the estimate.

In the month of June last, the 16 eastern sections of this division were put under contract, but the work upon them was not generally commenced until about the 20th of July. The inclined planes, Nos. 3 and 4, are on the first and third sections. Those sections include a distance of 48,663 feet, of which about 38,000 feet are now prepared for the reception of the rails. And upon the 5th and 6th sections, the rails have been already laid, as well as upon several other parts. These two sections embrace a distance of 7,700 feet, or very nearly 1 $\frac{1}{2}$ miles.—They pass through a dense and heavily timbered forest, and although the work on them was not begun before the 25th

day of July, yet the rails were placed upon them before the 25th day of September, being within 60 days from the time they were commenced.

Tables O and P exhibit the actual cost of such sections of this division as are finished, and an estimate of such as are not yet completed. By these tables the length of the division is shown to be 14 miles $163\frac{9}{10}$ poles—the cost of the graduation alone to be \$103,518.55, or per pole $\$22,29\frac{5}{10}$ and per mile \$7,134.40—that of the masonry alone, including the cost of two superstructures of wood, to be \$32,719.29 $\frac{1}{4}$, or per pole $\$7,04\frac{6}{10}$ and per mile \$2,254.72:—and that of the graduation and masonry together, to be \$136,237.84 $\frac{1}{4}$, or per pole \$29,35 $\frac{1}{10}$, and per mile \$9,389.12.

Table P shows that the number of perches of masonry in common culverts and detached walls will be 4,240 $\frac{1}{2}$, and will cost \$6,600.98, or per perch $\$1,55\frac{6}{10}$.

That the number of perches in bridge or arched masonry will be 5,347 $\frac{1}{4}$, and will cost, including a superstructure of wood of 12 feet span over a farm road, and that of the superstructure of wood of 350 feet over the river Monocacy, \$26,118.31 $\frac{1}{4}$, or per perch \$4,88 $\frac{1}{10}$.

That the whole number of perches of masonry on this division, of all kinds, will be 9,587 $\frac{3}{4}$, and will cost, including the expense of the above superstructures of wood, \$32,719.29 $\frac{1}{4}$, or per perch \$3.41 $\frac{2}{10}$.

On this division there are six stone bridges, viz: four of arches of 12 feet chord each, and two of arches of 10 and 25 feet respectively; and one viaduct over a farm road of 12 feet span, composed of stone abutments and wooden superstructure. Also a bridge across the Monocacy, the abutments and piers of which are of stone and superstructure of wood. This bridge has three arches of 110 feet span each, the chords of which are elevated above the low water-line of the Monocacy 26 feet. Its whole length is 350 feet 3 inches, and its width is 23 feet 8 inches. It is so constructed that its floor forms a roof impervious to water, and securely protects the timbers beneath from the weather. The sides are to be weather boarded and painted. The masonry in the abutments and piers amounts to about 3,000 perches. The piers are ten feet thick at the top, and they, as well as the abutments, were raised from a rock foundation at a slope of one inch base to one foot altitude. They rise 22 feet above low water. This bridge was undertaken last November, by Mr. Lewis Wernwag. Every possible exertion has been made by that skilful and enterprising bridge builder, assisted by two of

his sons, to complete the work within the time stipulated by contract. It was fully expected that the abutments and piers could have been founded last fall, but an unusual rise of the river rendered this impracticable. But for this circumstance, the bridge would have been finished before the present time. No doubt, however, exists but that it will be placed in such condition, if not entirely finished, during this month, as to admit of the rails being laid upon it.

This bridge affords to the river three clear vents of 104 feet each. If it should be thought advisable hereafter, to substitute stone or brick arches for the present wooden arches, this may easily be effected by the erection of three additional piers, and the construction of six arches of about 45 feet chord each. The abutments and piers now built, are considered to be sufficiently substantial to support arches of that size.

Fifth Division.

This division is divided, into 16 sections and commences at the western end of the Monocacy bridge, and after pursuing the descending valley of that river for about a mile and a half, gently diverges from it, and, in its route to the "Point of Rocks" on the Potomac river, its point of termination, passes over one of the most fertile sections of our country, part of which is the large and beautiful manor of the venerable Charles Carroll of Carrollton.

The work on this division was not generally commenced until the month of January last. Indeed, that on the 11th, 12th, and 13th sections was not begun until April. The proprietors (the Messrs. Michaels,) of the land over which these three sections pass, having positively refused to permit the entrance of the agents of the Company, within their limits, before the right of way was condemned by a jury, and the inclemency of the winter was such, that a jury could not act before spring.

An estimate of the cost of this division for graduation and masonry, was submitted last January, amounting to the sum of \$95,296.91. It is now fully ascertained that its cost cannot exceed \$78,682.50, thus shewing that the actual cost will fall short of the estimate, about \$16,600.

The whole of the masonry on this division has been finished, and the graduation also, with the exception of a few hundred feet on each of the following sections, viz: 6th, 11th, and 13th. The 6th and 11th will be completed within the present month, but, it is feared that the 13th cannot be finished before the mid-

dle of November. This latter section passes for several hundred feet in length, and a part of the way, at least 20 feet in depth, through a solid mass of conglomerate marble, which has been found to be extremely difficult of excavation. The contractor is now making vigorous exertions, and the opinion is confidently entertained, that it will interpose no obstacle to the completion, to the laying down of the rails within the present year.

Tables Q and R, exhibit the number and length of the sections of this division, and their respective cost, both for graduation and masonry. The length of the Division is 11 miles and 9 12-100 poles. The actual and estimated cost of the graduation is shown to be \$66,614.29, or per pole \$18.87 $\frac{1}{2}$, and per mile \$6,040,—for masonry alone, including the cost of a viaduct for the Georgetown turnpike, where it passes over the railroad,—to be \$12,068.21 $\frac{3}{4}$, or per pole \$3.41 $\frac{9}{10}$, and per mile \$1,094.08:—And for graduation and masonry together \$78,682.50 $\frac{3}{4}$, or per pole \$22.29 $\frac{4}{100}$, and per mile \$7,134.08.

Table R shows the number of perches of masonry built in culverts, and detached walls, to be 2,335 $\frac{1}{4}$, and to have cost \$3,316.37 $\frac{1}{2}$, or per perch \$1.42.

That the number of perches of arched or bridge masonry is 2,750 $\frac{1}{2}$, and has cost, including the superstructure of wood of the viaduct on the Georgetown turnpike road, \$8,751.84 $\frac{1}{4}$, or per perch \$3.18 1-10:—

That the masonry of every kind on this division, numbers 5,085 $\frac{1}{4}$ perches, and has cost, including the aforesaid superstructure of wood, \$12,068.21 $\frac{3}{4}$, or per perch \$2.37 2-10.

On this division there are only three bridges of one arch each, and of the following chords, to wit, 30, 20, and 10 feet respectively, and one viaduct over the rail-road for the accommodation of the Georgetown and Frederick turnpike road, of stone abutments and superstructure of wood of 24 feet span. This viaduct is elevated 16 $\frac{1}{2}$ feet above the graduated surface of the rail-road.

Lateral Road to Frederick.

This branch commences at a point, ten poles west of the western end of the bridge over the Monocacy, and pursuing the western margin of that river upwards, for about one mile, diverges from it to the northwest, and after crossing the land intermediate to that river, and Carroll's creek, terminates at the western boundary of the Depot at Frederick. Its point of termination is 60 miles and ten poles from Pratt street, Baltimore.

The work on this branch was generally commenced in the beginning of the month of July last. The graduation may be considered heavy. Upon it is one long and deep excavation through solid limestone rock, besides several other rocky cuts of less magnitude.

Tables S and T, show the length of this branch to be 3 miles and 130 poles. That the estimated cost of the graduation will be \$ 29,338.45, or per pole \$26.91 6-10, and per mile \$8,613.12:

That the cost of the masonry, which is all finished, has been \$ 920.46 1-4, or the pole \$ 0.84 4-10, and per mile \$ 270.08 : And for graduation and masonry together, will be \$30,258.91 1-4, or per pole \$ 27.76, and per mile \$ 8,883.20.

The greater portion of this branch is now ready for the reception of the rails and the remainder, it is believed, will be finished in the course of 15 or 20 days. On it there are no bridges. Table T shows the number of perches built in common culverts, and detached walls to be 588 at a cost of \$ 920.-46 1-4, or per perch \$ 1.56½.

Graduation and Masonry of the whole Line.

Table W is a condensed abstract taken from the tables herein before referred to, and from some of the tables which accompanied my last annual report. It exhibits the Divisions,—the sections and their respective lengths,—the cost of the graduation, the quality, quantity and cost of the masonry on each section,—and the aggregate cost of the graduation and masonry on the whole line from Pratt street, Baltimore, to the "Point of Rocks" on the river Potomac.

From this table the following facts are derived.

1. That the distance from Pratt street, Baltimore, to the Potomac will be 67 miles and 199 16-100 poles, or $67\frac{5}{8}$ miles.—and that the distance from Baltimore to Frederick will be 60 miles and 10 poles.

2. That the whole cost of the city and first divisions, for graduation and masonry has been \$ 605,912.59, or per pole \$ 144.85 8-10, and per mile \$ 46,354.56.

3. That the whole cost of the 2d division for graduation and masonry has been \$ 118,327.12, or per pole \$ 31.63 9-10, and per mile \$ 10,124.48.

4. That the whole cost of the 3d division for graduation and masonry will not exceed \$ 132,196.28, or per pole \$ 23.84 2-10, and per mile \$ 7,629.44.

5. That the whole cost of the graduation and masonry on the 4th division will not exceed \$136,237.84 1-4, or per pole \$29.35 1-10 and per mile \$9,389.12.

6. That the whole cost of the graduation and masonry of the 5th division will not exceed \$78,682.50 $\frac{3}{4}$, or per pole \$22.-29 4-10, and per mile \$7,134.08.

7. That the whole cost of the graduation and masonry of the lateral branch to Frederick will not exceed \$30,258.91 1-4, or per pole \$27.76 and per mile \$8,883.20.

8. That the total cost of the graduation alone of the whole line will not exceed the sum of \$754,204.39, or per pole \$34.85 3-10, and per mile \$11,152.96.

9. That the total cost of the masonry of all descriptions on the whole line, including the cost of the superstructures of wood of two viaducts, to wit, one over a farm road,—the other over the railway for the accommodation of the Georgetown turnpike road, and including also the large wooden superstructure across the Monocacy river, \$317,151.95, or per pole \$14.65 $\frac{6}{10}$, and per mile \$4,689.92.

10. That the total cost of both the graduation and masonry, including the cost of the aforesaid superstructures of wood, on the whole line, will not exceed \$1,071,356.34, or per pole \$49.51, and per mile \$15,843.20.

11. That the total quantum of masonry built, and to be built on the whole line, the lateral road inclusive, will be 80,303 1-4 perches, being on an average 1131 perches to a mile, and which, including the cost of the aforesaid superstructures of wood, will not exceed in cost \$318,072.41 1-4, or per perch \$3.96.

12. That the graduation and masonry on the main stem and lateral road, being together a distance of 71 miles 9 16-100 poles, will cost \$1,101,615.25 1-4, or per pole \$48.46 7-10, and per mile \$15,509.44.

13. That the graduation of the first 13 miles has cost \$8,994.16 more than the next 54 $\frac{5}{8}$ miles, that is, between Ellicotts' mills and the "Point of Rocks" on the Potomac, will cost.

14. That the masonry on the first 13 miles exceeds in quantum that on the next 54 $\frac{5}{8}$ miles by upwards of 14,000 perches, and has cost \$131,474.68 more than that on the 54 $\frac{5}{8}$ miles will cost, including the expense of several superstructures of wood.

15. That the whole cost of the 2d, 3d, 4th and 5th divisions, extending from Ellicotts' mills to the Potomac, will be for graduation and masonry \$465,443.75, or per pole \$26.66 3-10, and per mile \$8,532.16,—whilst as shown above, that of the first 13 miles between Baltimore and Ellicotts mills has been \$605,-

912.59, or per pole \$ 144.85 8-10, and per mile \$46,354.56,—thus shewing that the first 13 miles has cost \$140,468.84 more than the next $54\frac{5}{8}$ miles will cost; and has cost per mile about $5\frac{1}{2}$ times as much.

16. That the graduation and masonry of the first $12\frac{3}{4}$ miles has cost as much as the remaining $54\frac{7}{8}$ will cost.

17. That the masonry on the first $8\frac{3}{4}$ miles has cost as much as that on the next $58\frac{7}{8}$ will cost.

18. That the graduation and masonry together has cost on the first 11 miles \$ 33,000 more than it will cost on the next $56\frac{5}{8}$ miles.

Expenditures.

The whole amount disbursed by me since my entrance into the service of the company, has been \$1,081,832.04, all of which has been duly accounted for. This sum has been applied to the following objects:

Graduation, - - - - -	\$717,809.87
Masonry, and superstructures of wood, -	302,342.03 $\frac{3}{4}$
Payment of the right of way for the road, and materials for its construction, repairs of county and farm roads, injured by the crossing of the rail road, &c. &c.	21,541.91
Salaries of officers, instruments, and various other contingencies,	29,256.52 $\frac{1}{2}$
Purchase of a quantity of lumber, tools, &c.*	10,881.69 $\frac{3}{4}$
	<hr/>
	\$1,081,832.04
	<hr/>

This statement shows that the expenditures on account of contingencies, which include the salaries of officers, cost of instruments, printing, and all other incidental expenses attendant upon the operations of my department, amount to only about $2\frac{3}{4}$ per cent, on all my other disbursements.

General Remarks.

In reviewing the operations confided to my superintendency, it will be found that during the last year, about $46\frac{1}{2}$ miles of road formation have been nearly effected; and when it is con-

*The lumber and tools have been delivered over to other officers of the company.

sidered, that a large proportion of the laborers who performed this work, were suddenly collected, and in some instances crowded into confined and inconvenient spaces to operate—that the weather during the last fall and winter were unusually unfavorable, that the location of the greatest part of the line, was not made until several months had elapsed, and indeed, that more than a fourth part of the distance was not located until within three or four months since, there cannot be the smallest doubt, but that with a regularly organized force, operating under such system as I propose to suggest, with ordinarily favorable weather, 50 or 60 miles of graduation and masonry, might be prepared for the reception of the rails within a year.

The work, in all its parts, has been executed with neatness and fidelity. The embankments have been formed with great care in the manner of laying their successive strata of earth, and will settle but little. Where the road runs in contact, either with the Patasco or Bush creek, it has been secured against the abrasion of the stream, by substantial stone embankments or an exterior coatings of stone. The past summer has been remarkable for heavy rains, and although the work was of recent execution, the damage sustained by it is of very inconsiderable consequence, not surpassing, if equalling, the injury experienced by turnpike roads from the same rains, to which I may add, that the masonry so far remains firm and substantial, and that no fears are entertained of its permanency.

For a detailed account of the manner of executing the graduation and masonry, I would respectfully refer to the accompanying [blank] articles of agreement, marked X and Y.

In the progress of a work of so great magnitude, involving as it has done, up to this period, in my department alone, an expenditure of considerably more than a million of dollars, it was to be expected, that failures would occur amongst the numerous contractors, and that occasional losses would be sustained by the laborers, a class of men, who of all others, are the least able to bear them. Every effort within my power, has been made to prevent losses being incurred by the laborers, and it affords me real pleasure, to be able to state my conviction, that less loss has been sustained, so far as concerns the graduation and masonry, on this work, than falls to the lot of laborers engaged in the ordinary pursuits of life, involving an equal amount of expense. It is believed, that the whole loss to laborers and mechanics, employed in the operations of this department, has not exceeded five thousand dollars, being less than a $\frac{1}{2}$ per cent on the amount disbursed.

Some of the contractors have, no doubt, been unfortunate in their contracts, but I am inclined to believe that they have generally escaped without actual loss, although they certainly have not, in many cases, realized the profits which their toils and industry ought to have produced. Efforts have also been made to prevent this meritorious class of our citizens, from entering into engagements which might prove prejudicial to their interests. They have been assured, that the company desired them to reap a just reward for their exertions and labors, and they have been cautioned to examine well the work for contract, before they presented their bids, both verbally and by such printed notices as the one accompanying this report, marked Z. And, indeed, after their bids have been accepted, and a contract thus virtually formed, when doubts existed as to the adequacy of their price, they have been so informed, and the option freely given them, either to execute the work or decline it. They are, however, in general, so well satisfied with the correctness of their own judgment, as seldom to relinquish the undertaking.

It has been shown that about $15\frac{1}{2}$ miles of the road, including parts of the 3d and 4th divisions, and the whole of the lateral road to Frederick, were but recently let. The graduation upon this distance, although not of the very heaviest character, was by no means inconsiderable. But three months were allowed for its execution, and for the construction of the masonry. To meet the expectations of the board of directors, as communicated by you, prompt measures were taken to assemble on the line a force adequate to the completion of the work. With this view, advertisements both in the public journals and by hand-bills, were extensively circulated, inviting laborers and mechanics to the road. A competent force was collected and both the graduation and masonry are now very nearly completed. But about $3\frac{1}{2}$ miles, only in detached portions, of those $15\frac{1}{2}$ being at this time unfinished.

The contractors on a work so urgently prosecuted, must unavoidably pay higher wages for labor. The price too, of every kind of necessary supply is increased in consequence of the sudden and great demand. Every description of labour too, must be employed. These different causes, together with others which occur in consequence of the haste with which the work is executed, conspire greatly to increase its cost. And in collecting a force thus hastily to be employed but for a short period, and then to be discharged, other evils besides increased expense may be expected. It being necessary to employ all de-

scriptions of persons, the disorderly and intemperate, as well as the sober and correct, disorder and riot may very reasonably be apprehended to ensue, in a greater or lesser degree, and such has been the effect on this work, but fortunately, to a very limited extent, so far as my department has been concerned.

In the future prosecution of the work, if circumstances within the control of the board admit, I would respectfully recommend that from six to nine months, according to the character of the work, be prescribed as the time for its execution. And I would further recommend that a second *letting* be made before the labourers employed on the first shall have been discharged, and the contractors dispersed. By this system, the laborers who are found worthy, and who have become accustomed to the rules which govern, may be retained in the service of the company. When a corps of this character is duly organized and regularly employed on a work, the number may, at any time, be augmented without jeopardy to the harmony and good order which prevail. The work may thus be carried on advantageously to the interests of the company, and in every respect more satisfactorily to all its officers, agents and contractors, as well as to the laborers themselves. It is also respectfully suggested that an arrangement be made by which the heavy and difficult parts of the graduation and the large bridges could be put under contract, one season in advance of the lighter portions of the work, this would be attended with very advantageous consequences, as by it, all haste would be avoided,—the cost consequently lessened, and after the first year the work could be prosecuted to any desirable extent.

If in the future extension of the road, the work could be put under contract, both in the valley of the Potomac river and in the Alleghany mountains, in the same year, very important advantages would, in my opinion, be realized by the company. It is known that that valley is most generally unhealthy during the summer and autumnal months, and particularly so, to such as are not accustomed to its climate. By the arrangement here suggested, the men could be employed during the winter and spring months on the Potomac, and transferred to the mountain district, where the air is salubrious, and be there employed during the summer and fall seasons, thus the contractors would be enabled to retain their force together, and keep them fully employed the whole year,—much expense would thus be saved, the work could be executed in about half the time,—and what is still more important, the lives of very many valuable men would be preserved.

The determination heretofore adopted, of excluding from the line of the road, distilled spirits, has been rigidly adhered to. In carrying into effect this measure, I have been so generally sustained by the contractors and agents of the company, that only one contractor has been dismissed, for infraction of that clause of

his contract requiring him to dispense with the use of ardent spirits, and very important advantages have resulted from this measure, both to the work and to those persons who have been employed upon it.

Licences for retailing spirituous liquors are, however, obtained with so much facility and at so moderate a charge in this state, and the cupidity of many is so great, that shops have been opened for the sale of this article in many places contiguous to and along the line, which brought it so easily within reach of the laborers as frequently to allure many of them from their duty, to the great annoyance of the contractors, and injury of the community. This evil claims from the legislature, serious consideration and it is earnestly hoped, that another session of the general assembly will not be permitted to pass without some effort being made for its suppression.

In closing this report, it is due to those vigilant officers, my assistants, Robert Wilson and Henry M. Pettit, to state, and I do so with great pleasure, that I have derived very important aid in the execution of the trust confided to me; from the former in the superintendency of the masonry, and from the latter in that of the graduation. Mr. Pettit was assisted during the last year, by John Miller, and for part of the year by J. H. Vance, Samuel Pettit, Caleb B. Moore, Alfred Marks, Paul Borland, and John Iglehart.

Respectfully submitted,
CASPAR W. WEVER.



A STATEMENT exhibiting the number and length of the Sections of the Third Division of the Baltimore and Ohio Rail Road—their distance from Pratt street, Baltimore—the names of the Contractors—the quantity of Excavation and Embankment on the Sections—the Prices—the Actual and Estimated cost of each Section—and total cost of the Graduation of the Division.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

No. of Section.	No. of Station of Commencement.	No. of Station of Termination.	Length of section in feet.	Length of section in poles.	Length of Division.		Total distance from Pratt street.		Names of Contractors.	Cubic yards of Excavation on each section.	Cubic yards of Embankment on each section.	Price per cubic yard of the greater quantity, whether Excavation or Embankment.	Cost of each section at contract price.	Actual or probable extra cost in consequence of change of line of location, or for "fast rock."	Total actual or estimated cost of each section.	Total estimated cost of the Division.
					Miles	Poles	Miles	Poles								
1	1236	1248.5	1247	75.58		75.58	24	318.25	Jonathan Jessop,	23.177	18.613		6.021	34	6.021	34
2	1248.5	1272	2350	142.42		218.	25	140.67	Jonathan Jessop,	9.691	11.912	35	4.169	20	4.169	20
3	1272	1302	3016	182.66	1	80.66	26	3.33	Patrick King,	6.757	8.386	31	2.599	66	2.599	66
4	1302	1326	2400	145.45		226.11		148.78	Jonathan Jessop,	8.625	6.325	28	2.415		2.415	15.205
5	1326	1347	2100	127.27	2	33.38		276.05	Jesse Greenfield,	10.939	13.441	45,30&25	5.314	35	5.314	35
6	1347	1362	1452	88.		121.38	27	44.05	Thomas Real,	3.835	7.252	30	2.175	63	2.645	43
7	1362	1385	2300	139.39		260.77		183.44	John Corbay,	2.818	3.958	25	989	50	989	50
8	1385	1403	1783	108.06	3	48.83		291.50	John Corbay,	3.362	4.902	23	1.127	46	56	95
9	1403	1433	2984	180.84		329.67	28	152.34	Matthew Borland,	6.460	7.198	35	2.519	30	366	90
10	1433	1447	1399	84.18		313.85		236.52	Matthew Borland,	988	2.663	22	585	90	585	90
11	1447	1460	1296	78.54	4	72.39		315.06	D. Miller & John Lafferty,	6.494	6.509	40&50	2.434	46	2.434	46
12	1460	1473	1300	78.78		151.17	29	73.84	C. McElfresh & John Lafferty,	1.484	1.484	25&65	522	25	522	25
13	1473	1488	1500	90.90		242.07		164.74	C Marks & Benjamin Cornelius,	12.217	10.284	39	4.764	63	4.764	63
14	1488	1498	1000	60.60		302.67		225.34	Elijah Norris,	428	1.733	20	346	60	361	60
15	1498	1512	1400	84.84	5	67.51		310.18	Charles Sipes,	5.804	9.762	33	3.221	46	3.221	46
16	1512	1519	782	47.39		114.90	30	37.57	Samuel Wood,	85	1.159	25	289	75	289	75
17	1519	1530	995	60.30		175.20		97.87	Coyle & Riley,	5.495	3.934	35	1.923	25	206	70
18	1530	1550	2000	121.21		296.41		219.08	John Lafferty,	3.163	4.612	30	1.383	59	36	90
19	1550	1574	2383	144.42	6	120.83	31	43.50	James Donaldson,	1.251	4.162	28½	1.186	17	1.186	17
20	1574	1608	3400	206.09	7	6.92		249.59	Robert Smith & John Coyle,	11.992	12.354	39,25&100	4.679	75	60	4.739
21	1608	1628	1989	120.50		127.42	32	50.09	William Marks,	1.870	4.327	24	1.038	48	1.038	48
22	1628	1647	1966	119.14		246.56		169.23	William Marks,	3.698	8.403	25	2.100	75	2.100	75
23	1647	1671	2400	145.45	8	72.01		314.68	Robert Williams,	1.658	11.804	20	2.360	80	70	60
24	1671	1692	1978	119.94		191.95	33	114.62	Kasson & Otis,	4.159	4.315	35	1.510	25	1.510	25
25	1692	1704	1200	72.72		264.67		187.34	Kasson & Otis,	4.341	2.383	37	1.606	17	1.606	17
26	1704	1732	2800	169.69	9	114.36	34	37.03	Kasson & Otis,	6.529	10.267	25	2.566	75	2.566	74
27	1732	1785	5300	321.21	10	115.57	35	38.24	Kasson & Otis,	3.364	24.706	27½	6.794	15	70	6.864
28	1785	1808	2341	141.93		257.50		180.17	David Lemon,	1.390	13.141	25	3.285	25	3.285	25
29	1808	1832	2400	145.45	11	82.95	36	5.62	John Davidson,	3.250	13.372	15	2.005	80	72	80
30	1832	1839	682	41.33		124.28		46.95	John Davidson,	369	817	15	122	55	122	55
31	1839	1863	2400	145.45		269.73		192.40	Whelan & Johnston,	5.867	13.861	23	3.188	03	300	3.488
32	1863	1890	2669	161.75	12	111.48	37	34.15	Samuel Wood,	6.553	5.725	20	1.310	60	561	1.871
33	1890	1929	3900	236.36	13	27.84		270.51	Coyle & Riley,	10.047	9.592	25	2.511	75	2.511	75
34	1929	1962	3300	200.		227.84	38	150.51	James Sherden,	6.081	9.027	24	2.166	48	312	2.478
35	1962	2009	4700	284.84	14	192.68	39	115.35	Whelan & Johnston,	9.873	6.800	24	2.369	52	254	02
36	2009	2028	1900	115.15		307.83		230.50	John Lafferty,	2.817	6.809	33	2.246	97	552	07
37	2028	2050	2200	133.33	15	121.16	40	43.83	John Lafferty,	3.858	7.617	25	1.904	25	245	70
38	2050	2089	3909	236.90	16	38.06		280.73	James Fresh,	24.346	26.963	29	7.819	27	1.108	41
39	2089	2111	2303	139.54		177.60	41	100.27	William H. Fresh,	11.191	19.781	22	4.351	82	816	48
40	2111	2132	2071	125.49		303.09		225.76	Chistopher Midler,	9.323	7.313	23	2.144	29	2.805	11
41	2132	2152	2000	121.20	17	104.29	42	26.96	Chistopher Midler,	7.390	8.897	22	1.957	34	614	24



AN EXHIBIT of the Masonry on the Third Division of the Baltimore and Ohio Rail Road, showing the names of the Contractors—its character, actual and estimated quantum and cost on each Section,—and the total actual and estimated quantum and cost on the Division.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

No. of Section.	Names of Contractors.	Culverts and Detached Walls.					Arched or Bridge Masonry.					Total quantum and cost of Masonry of all kinds on the Division.	
		No. of perches	Price per perch.	Cost on each Section.	Total number of perches on the Division.	Total cost on the Division.	No. of perches	Price per perch.	Cost on each section.	Total number of perches on the Division.	Total cost on the Division.	No. of perches.	Cost.
1	Jonathan Jessop,	124 $\frac{1}{4}$	2.00	248 $\frac{50}{100}$	124 $\frac{1}{4}$	248 $\frac{50}{100}$						124 $\frac{1}{4}$	248 $\frac{50}{100}$
2	Jonathan Jessop,	248	1.75	434	372 $\frac{1}{4}$	682 $\frac{50}{100}$						372 $\frac{1}{4}$	682 $\frac{50}{100}$
3	Jonathan Jessop,	132 $\frac{3}{4}$	1.75	232 $\frac{31}{100}$	505	914 $\frac{81}{100}$	227 $\frac{1}{2}$	2.87 $\frac{1}{2}$	654 $\frac{06}{100}$	227 $\frac{1}{2}$	654 $\frac{06}{100}$	732 $\frac{3}{4}$	1,568 $\frac{87}{100}$
4	Jonathan Jessop,	78 $\frac{3}{4}$	1.75	137 $\frac{81}{100}$	583 $\frac{3}{4}$	1,052 $\frac{62}{100}$				227 $\frac{1}{2}$	654 $\frac{06}{100}$	811 $\frac{1}{4}$	1,706 $\frac{68}{100}$
5	Jesse Greenfield,	41 $\frac{1}{4}$	1.25	51 $\frac{56}{100}$	625	1,104 $\frac{18}{100}$	1,216 $\frac{1}{2}$	4.25	5,260 $\frac{12}{100}$	1,444	5,914 $\frac{18}{100}$	2,009	7,018 $\frac{37}{100}$
6	Thomas Real,	162	1.50	259 $\frac{65}{100}$	787	1,363 $\frac{83}{100}$				1,444	5,914 $\frac{18}{100}$	2,231	7,278 $\frac{02}{100}$
7	John Corbay,	66	1.25	82 $\frac{50}{100}$	853	1,446 $\frac{33}{100}$				1,444	5,914 $\frac{18}{100}$	2,297	7,360 $\frac{52}{100}$
8	John Corbay,	141	1.50	211 $\frac{50}{100}$	994	1,657 $\frac{83}{100}$				1,444	5,914 $\frac{18}{100}$	2,438	7,572 $\frac{02}{100}$
9	Matthew Borland,	112 $\frac{1}{2}$	1.25	140 $\frac{62}{100}$	1,106 $\frac{1}{2}$	1,798 $\frac{46}{100}$				1,444	5,914 $\frac{18}{100}$	2,550 $\frac{1}{2}$	7,712 $\frac{65}{100}$
10	Matthew Borland,	45 $\frac{1}{4}$	1.50	67 $\frac{87}{100}$	1,151 $\frac{1}{4}$	1,866 $\frac{33}{100}$				1,444	5,914 $\frac{18}{100}$	2,595 $\frac{3}{4}$	7,780 $\frac{52}{100}$
11	Morris O'Friel,	115 $\frac{1}{4}$	1.25	144 $\frac{06}{100}$	1,267	2,010 $\frac{40}{100}$				1,444	5,914 $\frac{18}{100}$	2,711 $\frac{1}{2}$	7,924 $\frac{58}{100}$
12	Charles McElfresh,	76 $\frac{3}{4}$	1.25	95 $\frac{93}{100}$	1,343 $\frac{3}{4}$	2,106 $\frac{33}{100}$				1,444	5,914 $\frac{18}{100}$	2,787 $\frac{3}{4}$	8,020 $\frac{52}{100}$
13	William Marks,	191 $\frac{1}{2}$	1.00	191 $\frac{75}{100}$	1,535 $\frac{1}{2}$	2,298 $\frac{08}{100}$				1,444	5,914 $\frac{18}{100}$	2,979 $\frac{1}{2}$	8,212 $\frac{27}{100}$
14	Elijah Norris,	27 $\frac{1}{2}$	1.00	27 $\frac{50}{100}$	1,563	2,325 $\frac{58}{100}$				1,444	5,914 $\frac{18}{100}$	3,007	8,239 $\frac{77}{100}$
15	William Marks,	73 $\frac{1}{2}$	1.00	73 $\frac{25}{100}$	1,636 $\frac{1}{2}$	2,398 $\frac{83}{100}$				1,444	5,914 $\frac{18}{100}$	3,080 $\frac{1}{2}$	8,313 $\frac{02}{100}$
16	Samuel Wood,	18 $\frac{1}{2}$	1.00	18 $\frac{50}{100}$	1,654 $\frac{3}{2}$	2,417 $\frac{33}{100}$				1,444	5,914 $\frac{18}{100}$	3,098 $\frac{3}{4}$	8,331 $\frac{52}{100}$
17	Coyle & Riley,	62 $\frac{1}{2}$	1.00	62 $\frac{50}{100}$	1,717 $\frac{1}{2}$	2,479 $\frac{83}{100}$				1,444	5,914 $\frac{18}{100}$	3,161 $\frac{1}{2}$	8,394 $\frac{02}{100}$
18	William Marks,	105 $\frac{1}{4}$	1.00	105 $\frac{25}{100}$	1,822 $\frac{1}{2}$	2,585 $\frac{08}{100}$				1,444	5,914 $\frac{18}{100}$	3,266 $\frac{1}{2}$	8,499 $\frac{27}{100}$
19	James Donaldson,	96 $\frac{1}{2}$	1.00	96 $\frac{50}{100}$	1,919	2,681 $\frac{58}{100}$				1,444	5,914 $\frac{18}{100}$	3,363	8,595 $\frac{77}{100}$
20	Robert Smith,	148 $\frac{1}{2}$	1.00	148 $\frac{50}{100}$	2,067 $\frac{1}{2}$	2,830 $\frac{08}{100}$				1,444	5,914 $\frac{18}{100}$	3,511 $\frac{1}{2}$	8,744 $\frac{27}{100}$
21	William Marks,	101 $\frac{3}{4}$	1.00	101 $\frac{75}{100}$	2,169 $\frac{3}{4}$	2,931 $\frac{83}{100}$				1,444	5,914 $\frac{18}{100}$	3,613 $\frac{3}{4}$	8,846 $\frac{02}{100}$
22	William Marks,	21 $\frac{1}{2}$	1.00	21 $\frac{50}{100}$	2,190 $\frac{3}{2}$	2,953 $\frac{33}{100}$	275	2.50	692 $\frac{50}{100}$	1,719	6,606 $\frac{68}{100}$	3,909 $\frac{3}{4}$	9,560 $\frac{02}{100}$
23	William Marks,	95	1.00	95	2,285 $\frac{3}{4}$	3,048 $\frac{33}{100}$				1,719	6,606 $\frac{68}{100}$	4,004 $\frac{3}{4}$	9,655 $\frac{02}{100}$
24	William Otis,	96 $\frac{1}{4}$	1.50	144 $\frac{37}{100}$	2,382	3,192 $\frac{71}{100}$				1,719	6,606 $\frac{68}{100}$	4,101	9,799 $\frac{40}{100}$
25	William Otis,	66	1.50	111	2,448	3,303 $\frac{71}{100}$				1,719	6,606 $\frac{68}{100}$	4,167	9,910 $\frac{40}{100}$
26	William Otis,	25 $\frac{3}{4}$	2.00	51 $\frac{50}{100}$	2,473 $\frac{3}{4}$	3,355 $\frac{21}{100}$				1,719	6,606 $\frac{68}{100}$	4,192 $\frac{3}{4}$	9,961 $\frac{90}{100}$
27	Abraham Beagle,	65 $\frac{1}{4}$	1.25	81 $\frac{56}{100}$	2,539	3,436 $\frac{77}{100}$				1,719	6,606 $\frac{68}{100}$	4,258	10,043 $\frac{46}{100}$
28	Abraham Beagle,	169 $\frac{1}{4}$	1.25	211 $\frac{56}{100}$	2,708 $\frac{1}{4}$	3,648 $\frac{33}{100}$				1,719	6,606 $\frac{68}{100}$	4,427 $\frac{1}{4}$	10,255 $\frac{02}{100}$
29	Abraham Beagle,	46 $\frac{1}{4}$	1.12 $\frac{1}{2}$	52 $\frac{03}{100}$	2,754 $\frac{1}{4}$	3,700 $\frac{36}{100}$				1,719	6,606 $\frac{68}{100}$	4,473 $\frac{1}{2}$	10,307 $\frac{05}{100}$
30	Abraham Beagle,	55	1.12 $\frac{1}{2}$	61 $\frac{87}{100}$	2,809 $\frac{1}{2}$	3,762 $\frac{24}{100}$				1,719	6,606 $\frac{68}{100}$	4,528 $\frac{1}{2}$	10,368 $\frac{93}{100}$
31	Simon Frieze,	220 $\frac{1}{2}$	1.75	385 $\frac{87}{100}$	3,030	4,148 $\frac{11}{100}$	669	3.00	2,007	2,388	8,613 $\frac{68}{100}$	5,418	12,761 $\frac{80}{100}$
32	Abraham Beagle,	95 $\frac{1}{4}$	1.10	104 $\frac{77}{100}$	3,125 $\frac{1}{4}$	4,252 $\frac{89}{100}$				2,388	8,613 $\frac{68}{100}$	5,513 $\frac{1}{4}$	12,866 $\frac{58}{100}$
33	Abraham Beagle,	100	1.00	100	3,225 $\frac{1}{2}$	4,352 $\frac{89}{100}$				2,388	8,613 $\frac{68}{100}$	5,613 $\frac{1}{2}$	12,966 $\frac{58}{100}$
34	Abraham Beagle,	110 $\frac{1}{2}$	1.00	110 $\frac{50}{100}$	3,335 $\frac{1}{2}$	4,463 $\frac{39}{100}$				2,388	8,613 $\frac{68}{100}$	5,723 $\frac{3}{4}$	13,077 $\frac{08}{100}$
35	Abraham Beagle,	176 $\frac{1}{4}$	1.00	176 $\frac{25}{100}$	3,512	4,639 $\frac{64}{100}$				2,388	8,613 $\frac{68}{100}$	5,900	13,253 $\frac{36}{100}$
36	John Lafferty,	228 $\frac{1}{2}$	2.00	457	3,740 $\frac{1}{2}$	5,096 $\frac{64}{100}$				2,388	8,613 $\frac{68}{100}$	6,128 $\frac{1}{2}$	13,710 $\frac{36}{100}$
37	John Lafferty,	158 $\frac{1}{4}$	2.00	316 $\frac{50}{100}$	3,898 $\frac{3}{4}$	5,413 $\frac{14}{100}$				2,388	8,613 $\frac{68}{100}$	6,286 $\frac{3}{4}$	14,026 $\frac{83}{100}$
38	James Fresh,	100	1.75	175	3,998 $\frac{3}{4}$	5,588 $\frac{14}{100}$				2,388	8,613 $\frac{68}{100}$	6,386 $\frac{3}{4}$	14,201 $\frac{83}{100}$
39	William H. Fresh,	275	1.75	481 $\frac{25}{100}$	4,275 $\frac{3}{4}$	6,069 $\frac{39}{100}$	1,050	4.00	4,200	3,438	12,813 $\frac{68}{100}$	7,711 $\frac{3}{4}$	18,885 $\frac{08}{100}$
40	Jesse Greenfield,					6,069 $\frac{39}{100}$					12,813 $\frac{68}{100}$	7,831 $\frac{3}{4}$	19,063 $\frac{08}{100}$
41	Christopher Midler,	120	1.50	180		6,249 $\frac{39}{100}$					12,813 $\frac{68}{100}$	7,903 $\frac{3}{4}$	19,171 $\frac{08}{100}$
	Christopher Midler,	72	1.50	108	4,465 $\frac{3}{4}$	6,357 $\frac{39}{100}$				3,438	12,813 $\frac{68}{100}$	7,903 $\frac{3}{4}$	19,171 $\frac{08}{100}$



A STATEMENT exhibiting the number and length of the Sections of the Fourth Division of the Baltimore and Ohio Rail Road—their distance from Pratt street, Baltimore—the names of the Contractors—the quantity of Excavation and Embankment on the Sections—the Prices—the Actual and Estimated cost of each Section—and total cost of the Graduation of the Division.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

No. of Section.	No. of Station of Commencement.	No. of Station of Termination.	Length of section in feet.	Length of section in poles.	Length of Division.		Total distance from Pratt street.		Names of Contractors.	Cubic yards of Excavation on each section.	Cubic yards of Embankment on each section.	Price per cubic yard of the greater quantity, whether Excavation or Embankment.	Cost of each section at contract price.	Actual or probable extra cost in consequence of change of line of location or for "fast rock."	Total actual or estimated cost of each section.	Total estimated cost of the Division.				
					Miles	Poles	Miles	Poles												
1	2152	34	3.800	230.30		230 30	42	257.26	John Gray,	22.151	20.971	24	5.316	24	2.531	7.847	80	7.847	80	
2	34	67	3.287	199.21	1	109.51	43	136.47	James Cosgrave,	8.830	7.163	25	2.207	50	542	30	2.749	80	10.597	60
3	67	103	3.676	222.78	2	12.29	44	39.25	David Lemman,	7.129	22.823	31	7.075	13	281	30	7.356	43	17.954	03
4	103	145	4.200	254.54		266.83		293.79	Samuel F. Smith,	9.552	11.462	26	2.980	12	1.443	68	4.423	80	22.377	83
5	145	180	3.500	212.12	3	158.95	45	185.91	John Gray,	7.071	6.028	33	2.333	43	43	47	2.376	90	24.754	73
6	180	222	4.200	254.54	4	93.49	46	120.45	David Lyles,	5.734	4.334	31	1.777	54	134	73	1.912	27	26.667	
7	222	243	2.100	127.27		220.76		247.72	Joel B. Cahoon,	14.547	13.390	24	3.491	28	2.314	20	5.805	48	32.472	48
8	243	270	2.700	163.63	5	64.39	47	91.35	Patrick King,	7.258	7.342	24	1.762	08	576		2.338	08	34 810	56
9	270	303	3.300	200.		264.39		291.35	Elias Gumaer,	11.785	12.184	25	3.046				3.046		37.856	56
10	303	323	2.000	121.21	6	65.60	48	92.56	Michael Holman,	7.746	6.977	27	2.091	42	1.064	91	3.156	33	41.012	89
11	323	355	3.200	193.33		258.93		285.89	Greenbury M. Watkins,	10.802	12.185	21	2.558	85	1.865	28	4.424	13	45.437	01
12	355	380	2.500	151.51	7	90.44	49	117.40	Richard A. Clements,	15.310	16.511	23	3.797	53	3.085		6.882	53	52.319	55
13	380	412	3.200	193.33		283.77		301.73	Lloyd Pumphrey,	12.504	14.421	34	4.903	14	3.875	82	8.778	96	61.098	51
14	412	435	2.300	139.39	8	103.16	50	130.12	John Gillespie,	7.857	9.129	31	2.829	99	1.020		3.849	99	64.948	50
15	435	450	1.500	90.90		194.06		221.02	Matthew Borland,											
16	450	482	3.200	193.93	9	67.99	51	94.95	Lloyd Pumphrey,	12.767	14.670	32	4.694	40	4.647	40	9.341	80	77.619	82
17	482	523	4.100	249.49		317.48	52	24.44	Samuel Wilson,	9.355	17.452	19	3.315	88	60	32	3.376	20	80.996	02
18	523	550	2.700	163.62	10	161.10		188.06	Plummer Ijams,											
19	550	588	3.800	230.30	11	71.40	53	98.46	John Davidson,	22.704	18.622	29½	6.697	68	402	32	7.100		89.134	68
20	588	614	2.600	157.56		228.96		255.92	Christopher Midler,											
21	614	642	2.800	169.68	12	78.64	54	105.00	Peter Tracy,	1.959	7.360	14½	1.067	20			1.067	20	92.387	28
22	642	666	2.400	145.44		224.08		251.04	John Littlejohn,	2.757	4.706	29½	1.388	27			1.388	27	93.775	55
23	666	685	1.900	115.14	13	19.22	55	46.18	Anthony Loftus,	3.483	5.922	17&20	1.086	40			1.086	40	94.861	95
24	685	718	3.300	200.		219.22		246.18	Richard A. Clements,											
25	718	733	1.500	90.90		310.12	56	17.08	Charles Sipes,	3.505	2.845	29	907	48			907	48	99.662	23
26	733	758	2.854	172.96	14	163.08		190.04	Hugh Stewart,											
									Timothy Lanahan,											



AN EXHIBIT of the Masonry on the Fourth Division of the Baltimore and Ohio Rail Road, showing the names of the Contractors—its character, actual and estimated quantum and cost on each Section,—and the total actual and estimated quantum and cost on the Division.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

No. of Section.	Names of Contractors.	Culverts and Detached Walls.					Arched or Bridge Masonry.					Total quantum and cost of Masonry of all kinds on the Division.	
		No. of perches	Price per perch.	Cost on each Section.	Total number of perches on the Division.	Total cost on the Division.	No. of perches	Price per perch.	Cost on each section.	Total number of perches on the Division.	Total cost on the Division.	No. of perches.	Cost.
1	Simon Frieze,	193	1.94	374 42	193	374 42						193	374 42
2	Simon Frieze, James Cosgrave,	143	2.00	286	336	660 42	330	3.75	1.237 50	330	1.237 50	666	1.897 92
3	Simon Frieze, David Lemman,	240	1.75	420	576	1.080 42	204½	4.00	823	534½	2.060 50	1.110½	3.140 92
4	Samuel F. Smith,	329	1.75	575 75	905	1.656 17				534½	2.060 50	1.439½	3.716 67
5	John Gray,	231½	2.00	462 50	1.136½	2.118 67				534½	2.060 50	1.670¾	4.179 17
6	David Lyles,	115½	2.00	230 50	1.251½	2.349 17				534½	2.060 50	1.786	4.409 67
7	Sinclair & Wood, Jesse Greenfield,	25	2.00	50	1.276½	2.399 17	940	3.75 } 2.80 }	3.500	1.474½	5.560 50	2.751	7.959 67
8	Jesse Greenfield,	205½	1.75	359 18¾	1.481¾	2.758 35¾				1.474½	5.560 50	2.956¼	8.318 85¾
9	Elias Gumaer,	229	1.50	343 50	1.710¾	3.101 85¾				1.474½	5.560 50	3.185¼	8.662 35¾
10	Jesse Greenfield,	49½	1.50	73 87½	1.760	3.175 73¼	432¾	3.75	1.627 81¼	1.907¼	7.188 31¼	3.667¼	10.364 04½
11	Jesse Greenfield,	205	1.50	307 50	1.965	3.483 23¼				1.907¼	7.188 31¼	3.872¾	10.671 54½
12	Richard A. Clements, Jacob Thomas,	300	1.38	414	2.265	3.897 23¼	220	3.25	715	2.127¼	7.903 31¼	4.392¼	11.800 54½
13	James Esworthy, Lloyd Pumphrey,	80	1.50	120	2.345	4.017 23¼	220	3.25	715	2.347¼	8.618 31¼	4.692¼	12.635 54½
14	John Gillespie, Matthew Borland,	192	1.25	240	2.537	4.257 23¼				2.347¼	8.618 31¼	4.884¼	12.875 54½
15	Matthew Borland,	64½	1.50	96 75	2.601½	4.353 98¼				2.347¼	8.618 31¼	4.948¾	12.972 29½
16	Lloyd Pumphrey,	180	1.50	270	2.781½	4.623 98¼				2.347¼	8.618 31¼	5.128¾	13.242 29½
17	Samuel Wilson, Plummer Ijams,	300	1.50	450	3.081½	5.073 98¼				2.347¼	8.618 31¼	5.428¾	13.692 29½
18	Hugh Stewart, Plummer Ijams,	136½	1.62½	185 34¼	3.218	5.259 32½				2.347¼	8.618 31¼	5.565¼	13.877 63¾
19	John Davidson,	153¾	1.00	153 75	3.371¾	5.413 07½				2.347¼	8.618 31¼	5.719	14.031 38¾
20	Peter Tracy,	124¾	1.00	124 75	3.496¾	5.537 82½				2.347¼	8.618 31¼	5.843¾	14.156 13¾
21	John Littlejohn,	92	1.25	115	3.588½	5.652 82½				2.347¼	8.618 31¼	5.935¼	14.271 13¾
22	John Littlejohn,	69½	1.25	86 87½	3.658	5.739 70				2.347¼	8.618 31¼	6.005¼	14.358 01¼
23	Anthony Loftus,	33½	1.12½	37 40½	3.691¼	5.777 10½				2.347¼	8.618 31¼	6.038½	14.395 41¾
24	Charles Sipes,	381½	1.50	572 25	4.072¾	6.349 35½				2.347¼	8.618 31¼	6.420	14.967 66¾
25	Charles Sipes,	36¾	1.50	55 12½	4.109½	6.404 48				2.347¼	8.618 31¼	6.456¾	15.022 79¼
26	Timothy Lanahan, John Wernwag,	131	1.50	196 50	4.240½	6.600 98	3.000		17.500	5.347¼	26.118 31¼	9.587¾	32.719 29¼



A STATEMENT exhibiting the number and length of the Sections of the Fifth Division of the Baltimore and Ohio Rail Road—their distance from Pratt street, Baltimore—the names of the Contractors—the quantity of Excavation and Embankment on the Sections—the Prices—the Actual and Estimated cost of each Section—and total cost of the Graduation of the Division.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

No. of Section.	No. of Station of Commencement.	No. of Station of Termination.	Length of section in feet.	Length of section in poles.	Length of Division.		Total distance from Pratt street.		Names of Contractors.	Cubic yards of Excavation on each section.	Cubic yards of Embankment on each section.	Price per cubic yard of the greater quantity, whether Excavation or Embankment.	Cost of each section at contract price.	Actual or probable extra cost in consequence of change of line of location, or for "fast rock."	Total actual or estimated cost of each section.	Total estimated cost of the Division.
					Miles	Poles	Miles	Poles								
1	758	787	2.865	175.66		175.66	57	45.70	John M. Horton,	14.247	38.824	17	6.600	08	7.000	7.000
2	787	834	4.535	274.84	1	130.50	58	0.54	David Lemman,	13.593	15.740	16	2.518	40	2.518	40
3	834	863	2.900	175.74		306.24		176.28	Daniel K. Cahoon,	14.222	12.060	20	2.844	40	2.937	60
4	863	889	2.600	157.56	2	143.80	59	13.84	Lucian Wilcox,	5.204	5.250	14	735		735	13.191
5	889	908	1.900	115.14		258.94		123.98	Hugh Monaghan,	2.224	1.622	28	622	72	622	72
6	908	959	5.100	309.08	3	248.02	60	118.06	Lucian Wilcox,	10.903	12.944	25	3.236		3.436	17.249
7	959	1019	6.000	363.62	4	291.64	61	161.68	C. Doland & Co.	15.540	22.049	24	5.291	76	6.143	46
8	1019	1065	4.600	278.78	5	250.42	62	120.46	O'Magher & McCarthy,			17				
									Hugh Stewart,	15.998	12.973	45	5.915	15	6.160	55
9	1065	1095	3.000	181.80	6	112.22		302.26	Hugh Monaghan,	4.701	4.418	16	752	16	752	16
10	1095	1143	4.800	290.90	7	83.12	63	273.16	Spaulding & Larrabee,	12.487	27.196	19½	5.303	22	5.460	62
11	1143	1172	2.900	175.74		258.86	64	128.90	James Whelan,			18				
									Andrew Clements,	18.688	17.657	25	3.836		6.235	95
12	1172	1197	2.500	151.50	8	90.36		280.40	Andrew Clements,	11.848	18.394	17	3.126	98	3.126	98
13	1197	1244	4.701	284.84	9	55.20	65	245.24	Spaulding & Larrabee,							
									Edward Dawes,	20.482	16.286	27½	14.876	55	14.876	55
14	1244	1266	2.200	133.32		188.52	66	58.56	Richard A. Clements,	1.035	6.765	18	1.217	70	1.217	70
15	1266	1302	3.600	218.18	10	86.70		276.74	Hugh Gemmell,							
									Joseph Delaplane,	4.071	7.285	21	1.529	85	1.529	85
16	1302	1342	4.000	242.42	11	9.12	67	199.16	Charles L. Warner,			22				
									Michael Donavan,	14.136	18.680	25	3.860	75	3.860	75



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No. of Section.	Names of Contractors.	Culverts and Detached Walls.					Arched or Bridge Masonry.					Total quantum and cost of Masonry of all kinds on the Division.	
		No. of perches	Price per perch.	Cost on each Section.	Total number of perches on the Division.	Total cost on the Division.	No. of perches	Price per perch.	Cost on each section.	Total number of perches on the Division.	Total cost on the Division.	No. of perches.	Cost.
1	Lewis Wernwag,	170	1.75	297 50	170	297 50	388	3.50	1.508 1	388	1.508	558	855 50
2	Simon Fricze,	224 $\frac{1}{4}$	1.50	336 37 $\frac{1}{2}$	394 $\frac{1}{4}$	633 87 $\frac{1}{2}$	1.474	3.12 $\frac{1}{2}$	4.622 25	1.862	6.130 25	2.256 $\frac{1}{4}$	6.764 12 $\frac{1}{2}$
3					394 $\frac{1}{4}$	633 87 $\frac{1}{2}$				1.862	6.130 25	2.256 $\frac{1}{4}$	6.764 12 $\frac{1}{2}$
4	Andrew Fitzpatrick,	321 $\frac{1}{4}$	1.25	40 31 $\frac{1}{4}$	426 $\frac{1}{2}$	674 18 $\frac{3}{4}$				1.862	6.130 25	2.288 $\frac{1}{2}$	6.804 43 $\frac{3}{4}$
5	Andrew Fitzpatrick,	17 $\frac{3}{4}$	1.25	22 18 $\frac{3}{4}$	444 $\frac{1}{4}$	696 37 $\frac{1}{2}$				1.862	6.130 25	2.306 $\frac{1}{4}$	6.826 62 $\frac{1}{2}$
6	Andrew Fitzpatrick,	137 $\frac{3}{4}$	1.25	172 18 $\frac{3}{4}$	582	868 56 $\frac{1}{4}$				1.862	6.130 25	2.444	6.998 81 $\frac{1}{4}$
7	Luke O'Brien,	228	1.25	285	810	1.153 56 $\frac{1}{4}$				1.862	6.130 25	2.672	7.283 81 $\frac{1}{4}$
8	Hugh Stewart,	48 $\frac{3}{4}$	1.25	60 93 $\frac{3}{4}$	858 $\frac{3}{4}$	1.214 50				1.862	6.130 25	2.720 $\frac{3}{4}$	7.344 75
9	Hugh Monaghan,	40 $\frac{3}{4}$	1.50	61 12 $\frac{1}{2}$	899 $\frac{1}{2}$	1.275 62 $\frac{1}{2}$				1.862	6.130 25	2.761 $\frac{1}{2}$	7.405 87 $\frac{1}{2}$
10	Alexander Turner,	143	1.50	214 50	1.042 $\frac{1}{2}$	1.490 12 $\frac{1}{2}$	401 $\frac{1}{4}$	3.00	1.215 25	2.263 $\frac{1}{4}$	7.343 50	3.305 $\frac{3}{4}$	8.833 62 $\frac{1}{2}$
11	Alexander Turner,	273 $\frac{1}{2}$	1.50	410 25	1.316	1.900 37 $\frac{1}{2}$	487 $\frac{1}{4}$	2.87 $\frac{1}{2}$	1.408 34 $\frac{1}{4}$	2.750 $\frac{1}{2}$	8.751 84 $\frac{1}{4}$	4.066 $\frac{1}{2}$	10.632 21 $\frac{3}{4}$
12	Andrew Clements,	296 $\frac{3}{4}$	1.25	370 93 $\frac{3}{4}$	1.612 $\frac{3}{4}$	2.271 31 $\frac{1}{4}$				2.750 $\frac{1}{2}$	8.751 84 $\frac{1}{4}$	4.363 $\frac{1}{4}$	11.023 15 $\frac{1}{2}$
13	Hiram Larrabee,	113	1.25	141 25	1.725 $\frac{3}{4}$	2.412 56 $\frac{1}{4}$				2.750 $\frac{1}{2}$	8.751 84 $\frac{1}{4}$	4.476 $\frac{1}{4}$	11.164 40 $\frac{1}{2}$
14	Richard A. Clements,	84 $\frac{3}{4}$	1.50	127 12 $\frac{1}{2}$	1.810 $\frac{1}{2}$	2.539 68 $\frac{3}{4}$				2.750 $\frac{1}{2}$	8.751 84 $\frac{1}{4}$	4.561	11.291 53
15	Hugh Gemmill,	176 $\frac{3}{4}$	1.50	265 12 $\frac{1}{2}$	1.987 $\frac{1}{4}$	2.804 81 $\frac{1}{4}$				2.750 $\frac{1}{2}$	8.751 84 $\frac{1}{4}$	4.737 $\frac{3}{4}$	11.556 65 $\frac{1}{2}$
16	John Torney,		1.50										
"	Charles L. Warner,	348	1.25	511 56 $\frac{1}{4}$	2.335 $\frac{1}{4}$	3.316 37 $\frac{1}{2}$				2.750 $\frac{1}{2}$	8.751 84 $\frac{1}{4}$	5.085 $\frac{3}{4}$	12.068 21 $\frac{3}{4}$



A STATEMENT exhibiting the number and length of the Sections of the Lateral Branch from the Baltimore and Ohio Rail Road to the city of Frederick—their distance from Pratt street, Baltimore—the names of the Contractors—the quantity of Excavation and Embankment on the Sections—the prices—the actual and estimated cost of each Section—and total cost of the Graduation of the Lateral Road.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry, 1st October, 1831.

No. of Section.	No. of Station of Commencement.	No. of Station of Termination.	Length of Section in feet.	Length of Section in poles.	Length of Division.		Total distance from Pratt street.		Names of Contractors	Cubic yards of Excavation on each section.	Cubic yards of Embankment on each section.	Price per cubic yard of the greater quantity, whether Excavation or Embankment.	Cost of each section at contract price.	Actual or probable extra cost in consequence of change of line of location or for "fast rock,"	Total actual or estimated cost of each section.	Total estimated cost of the Division.
					Miles	Poles	Miles	Poles								
1	758	28	2.610	158.18		158.18	57	38.22	John M. Horton,	12.381	20.012	25	5.003	1.020	6.023	6.023
2	28	52	2.400	145.44		303.62		183.66	Timothy Lanahan,	10.319	11.825	40	4.730	120	4.850	10.873
3	52	83	3.100	187.86	1	171.48	58	51.52	Hugh Monaghan,	6.819	6.795	25	1.704	75	2.454	13.327
4	83	115	3.200	193.32	2	34.80		244.84	Daniel K. Cahoon,	13.438	12.124	25 & 75	8.531	50	10.531	23.859
5	115	182	6.687	405.20	3	130.	60	10.04	Jonathan Jessop,	8.884	18.264	30	5.479	20	5.479	29.338

[T.]

AN EXHIBIT of the Masonry on the Lateral Branch from the Baltimore and Ohio Rail Road to the city of Frederick, showing the names of the Contractors—the actual quantum and cost on each Section—and the actual quantum and cost on the Lateral Road.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

No. of Section.	Names of Contractors	No. of perches on each Section.	Price per perch.	Cost on each section.	Total number of perches.	Total cost.
1	John M. Morton,	138 $\frac{3}{4}$	1.50	208 $\frac{1}{2}$	138 $\frac{3}{4}$	208 $\frac{1}{2}$
2	Timothy Lanahan,	130 $\frac{3}{4}$	1.50	196 $\frac{1}{2}$	269 $\frac{1}{4}$	404 $\frac{25}{4}$
3	Hugh Monaghan,	105 $\frac{1}{4}$	1.50	157 $\frac{1}{2}$	374 $\frac{1}{4}$	562 $\frac{1}{2}$
4	Daniel K. Cahoon,	33	1.30	42 $\frac{90}{100}$	407 $\frac{3}{4}$	603 $\frac{1}{2}$
5	Michael Gardner,	180 $\frac{1}{4}$	1.75	315 $\frac{1}{4}$	588	920 $\frac{1}{4}$

AN EXHIBIT of the number and length of the Divisions and Sections of the Baltimore and Ohio Rail Road, from Baltimore to the "Point of Rocks" on the Potomac river—the total distance from Baltimore—the actual and estimated quantum, description and cost of Masonry, and cost of the Graduation of these Divisions and Sections—and the total cost of the whole line, including the Lateral Road to the city of Frederick.—Accompanying the report of CASPAR W. WEVER, Superintendent of Graduation and Masonry.—1st October, 1831.

[illegible]

RECAPITULATION.

Designation of Division.	Length of Division.		Actual and estimated cost of Graduation.	Actual and estimated quantum and cost of Masonry.								Actual and estimated aggregate cost of Graduation and masonry.
	Miles.	Poles.		Quantity and cost of culverts and detached walls.		Quantity and cost of arched or bridge Masonry.		Quantity and cost of Masonry of all kinds.				
				No. of perches.	Cost.	No. of perches.	Cost.	No. of perches.	Cost.			
City	1	111.32	25,601.59	8152	4,619.77	2,9103	18,431.59	3,7261	23,081.47	48,685.06		
1	1	211.41	33,281.68	4,915	12,055.52	38,628	189,176.11	13,571	30,231.31	557,226.52		
2	3	216.88	89,117.07	1,667	9,969.51	6,169	189,176.11	9,374	28,800.11	118,237.12		
3	17	101.25	13,023.26	4,165	6,357.39	3,438	12,815.68	7,903	13,171.98	132,196.88		
4	11	163.08	103,518.55	12,104	6,600.98	6,317	26,118.31	9,657	32,719.29	136,277.44		
5	11	9.12	96,614.21	2,335	3,316.37	2,750	8,761.81	5,083	12,068.21	78,682.90		
Let's read.	3	130.	29,387.46	588	920.16			688	920.16	30,258.11		
Totals	71	9.16	783,642.84	22,0581	43,870.65	38,214	274,201.76	80,363	318,072.41	1,101,515.23		

(X.)

Articles of agreement,

Made and concluded this day of
in the year of our Lord eighteen hundred and thirty
between

of the first part, and CASPAR W. WEVER, superintendent of the graduation and masonry of the Baltimore and Ohio rail road, in behalf of the Baltimore and Ohio Rail Road Company, of the second part:—

Whereas the aforesaid

hath agreed, for and inconsideration of the payments hereinafter mentioned, to graduate and prepare for the reception of the rail way, in a workmanlike manner, a certain part of the aforesaid Baltimore and Ohio rail road; which said part is the section of the division of said road, as recently laid out by the said company; and which part of said road, thus contracted for, is to be made and completed by the said party, of the first part, in the following manner and on the following conditions, that is to say: the trees shall be cut down and cleared in all cases a width not less than sixty-six feet; the hills to be cut down, the rocks and earth to be removed,—the valleys, hollows, and abutments of bridges to be filled,—so that the whole of the road shall have, in all its parts, a surface width of not less than twenty-three feet,—and shall be so formed as to conform to such field notes of survey and level as shall be furnished by the superintendent or his assistants. The sides of embankments and the banks of cuttings shall have such slope as the superintendent may direct. Under all embankments not exceeding two feet in height, the trees shall be grubbed—under all other embankments they may be cut even with the surface of the ground. The embankments shall be formed of successive layers of earth, of such thickness as the superintendent may prescribe, and shall be of such additional width and height as may be necessary, in the opinion of the superintendent, to provide for contraction and settlement. Their sides or slopes shall be covered with brush, in such places and in such manner as the superintendent may direct. No stumps, logs, leaves, or perishable matter of any kind, shall be put into the fillings. Ledges or superembankments of such width and height as the superintendent may approve shall be put on the edges of the embankments and side long fillings. One or more ditches shall be dug or made on each side of the road way of such width and depth, and in all such places as the

superintendent may designate. All redundant earth shall, in the first place, be applied to increase, equally, the width of the embankments and side fillings, and the balance shall be disposed of in such place as the superintendent may direct. In case the cuttings do not supply a sufficiency of earth for the fillings, the deficiency shall be, if so required by the superintendent, taken from the nearest cutting, so as to increase, regularly, the width of such cutting, or from such other place as the superintendent may point out. All rock on said section, which may, in the opinion of the superintendent, be of a quality suitable for stone rails, shall be quarried for that purpose, of such sizes and dimensions as the superintendent may prescribe and be deposited in such place as the superintendent may direct, for which such price shall be paid by the said company as the superintendent may adjudge reasonable and just.

French drains shall be constructed of such size and form, and in all such places as the superintendent may require. In all such cases, where the said road runs with, crosses or encroaches upon any river, creek or other water course, it shall be secured against damage from said stream, by forming the embankment of stone exclusively, or by lining it with stone at least three feet thick,—by the excavation of canals for the accommodation of the stream, by widening its channel, or in such other manner as the superintendent may direct. Wherever the rail road meets with, crosses, or runs along any road, heretofore used, such roads are to be opened and prepared, as may, in the opinion of the superintendent, be necessary for the accommodation of the travel. Masons or other persons who may contract with the aforesaid company for the building of bridges, culverts, walls or structures of wood, on any part of the said Baltimore and Ohio rail road, shall be permitted by the party of the first part, to take from the section of road hereby contracted for, such stones and timber as such mason or other person may think proper, and to haul any material over all or any part of said sections which may be levelled or elsewhere, to the place where such material may be required, without interruption. In case the said mason or other person shall, in the opinion of the superintendent, damage the said section of road, such sum of money as the superintendent may assess, shall be, by the said company, paid to the said party of the first part. The said party of the first part, shall commence working on said section at such place as the superintendent may designate, and shall, from time to time, work on such other parts or places of the said section as the superintendent

may require. The graduation of said section of road shall be made and completed on or before the

day of

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The said party of the first part shall personally superintend the work hereby contracted for, and shall not let or transfer his contract, or any part thereof, to any other person, without the consent of the superintendent; and shall not employ any workmen or labourers who commit depredations on the neighborhood, or insult travellers or other persons; and he shall, upon application of the superintendent, discharge any workman or labourer from his employment; and he shall not employ any workman or labourer who has been discharged by any other contractor for improper or disorderly conduct.

The said party of the first part hereby obligates himself not to keep or use, or suffer to be kept or used, any ardent spirits in his house or shantie, or on or near said section, and to discharge from his employment any workman or labourer who does keep it or use it.

At any time that the superintendent may require a change in either the vertical or horizontal position of the road, such change shall be accordingly made upon such terms as the superintendent may deem reasonable and just; and his award in the case shall be conclusive and final upon all parties.

Now this agreement, made and concluded on the

day of

in the year of our Lord

one thousand eight hundred and thirty

between

of

county, and state of

of the first

part, and *Caspar W. Wever*, superintendent of the graduation and masonry of the Baltimore and Ohio rail road, for and in behalf of the Baltimore and Ohio Rail Road Company, of the second part: WITNESSETH, That the said party of the first part, for himself, his heirs, executors and administrators, doth hereby covenant, promise and agree with the said *Caspar W. Wever*, superintendent as aforesaid, that the said party of the first part shall and will, well and faithfully, in a workman-like manner, on or before the day of

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make, finish and complete, in the manner and on the conditions herein before mentioned, all that part of the Baltimore and Ohio rail road, which is designated by the name of the

section of the

division of said road, be-

ginning at station No.

and ending at station

No.

In consideration whereof, the said Caspar W. Wever, superintendent as aforesaid, for and in behalf of the Baltimore and Ohio Rail Road Company, doth hereby covenant, promise and agree to and with the said party of the first part, his heirs, executors and administrators, that the said company shall and will, for doing and performing all the work aforesaid, well and truly pay, or cause to be paid, to the said party of the first part, his executors or administrators, at the rate of

for each and every cubic yard of excavation or embankment, as the one or the other may be the greater in quantity, which said section may contain, which shall be in full payment of all the work herein before described, in the following manner, that is to say: Each and every month, during the progress of the work, the company aforesaid, by their superintendent, will pay four-fifths of the relative value of such work as may be done, to be judged of by the superintendent, whose judgment shall be final and conclusive upon the said parties, and at such place as the superintendent may appoint, until the whole of the section, hereby contracted for, shall have been finished and completed, agreeably to contract, and shall have been accepted by the superintendent as so finished and completed, when the balance due shall forthwith be paid to the said party of the first part, his heirs, executors or administrators.

And the said party of the first part, for himself, his heirs, executors and administrators, further covenants and agrees with the said Caspar W. Wever, superintendent as aforesaid, that in case the said party of the first part shall not well and truly, from time to time, comply with and perform all the covenants herein before stated and stipulated on his part to be done, performed and complied with, in manner and form, and within the time herein before mentioned; or in case it should appear to the superintendent, for the time being, that the work does not progress or go on with sufficient speed, that the superintendent shall have power to determine that this contract has been abandoned; and in the event of such determination being made by the superintendent, the foregoing agreements, on the part of the party of the second part, and every clause and part thereof, shall become null and void, and that the unpaid fifth part of the relative value of work done on said section of road, shall be forfeited by the said party of the first part, and become the right and property of the said party of the second part; and further, that the said company shall be at liberty, and have full right and authority, any thing herein contained to the contrary notwithstanding, to employ and set to work, or contract with any person or persons

In witness whereof, the said Caspar W. Wever, for and in behalf of the aforesaid Baltimore and Ohio Rail Road Company, hath hereunto subscribed his name and affixed his seal of office, and the said _____ hath hereunto set _____ hand and seal the day and year first herein before written.

Signed, sealed and delivered }
in presence of }

[Y.]

this day of in the
year of our Lord, one thousand eight hundred and thirty
between

on the first part, and CASPAR W. WEVER, Superintendent of the Graduation and Masonry of the Baltimore and Ohio Rail Road, in behalf of the Baltimore and Ohio Rail Road Company, of the second part:—

WHEREAS the aforesaid party, of the first part, hath agreed for and in consideration of the payments hereinafter mentioned, to build and complete in a mechanical and workmanlike manner, all such arched bridges, gothic and common culverts and walls, which may, in the opinion of the superintendent, be necessary on the section of the division of said road, and which masonry thus contracted for by the said party of the first part, shall be built in the most strong and substantial manner—the foundations to be of such length and depth, and secured in such manner as the superintendent may direct. The walls of the abutments, piers, wings and parapets of the bridges, and the walls of the culverts and other walls, to be of such length, and thickness, and to conform to such slope as the superintendent may prescribe. The arch or arches to be composed of stone, dressed to such uniform and regular thickness and length, as the superintendent may direct, and of such slope that the sides shall range with, or form radii, of the circle of which the arch may be a segment, and to be so laid and fitted, that each range of stone may form, from side to side of the arch, a regular line or tier with its correspondent exterior or ring stones, and that each stone may break a joint of the

preceding range or tier. The parapet walls to be coped their entire length with stone shaped to such form, and to be of such size as the superintendent may approve. Such part or portion of the bridges to be *dry*, as the superintendent may designate, and the balance to be laid in mortar, to be composed of such sand and lime, and mixed in such proportions, as the superintendent may approve. No stone to be used but such as shall have been approved by the superintendent. Such part of the bridges as the superintendent may require, to be grouted and pointed in such manner as the superintendent may direct. All culverts and detached walls to be of dry masonry.

The said party of the first part, shall not let or transfer his contract, or any part thereof, to any other person, without the consent of the superintendent; and shall personally superintend the construction of the masonry hereby contracted for. The said party of the first part, shall not employ any mechanics, workmen or laborers, who commit depredations on the neighborhood, or insult travellers or other persons, or who have been discharged by any other contractor on said road for riotous or improper conduct, and he shall, upon application of the superintendent, immediately discharge any mechanic, workman or laborer, from his employment.

The said party of the first part, hereby obligates himself not to keep or use, or suffer to be kept or used, any ardent spirits in his house or shantie or on or near said section, and to discharge from his employment, any workman or laborer who does keep or use it.

Now THIS AGREEMENT, made and concluded on the
 day of in the year of our Lord
 one thousand eight hundred and thirty between

of

county, in the state of

of the first part, and Caspar W. Wever, superintendent of the Graduation and Masonry of the Baltimore and Ohio Rail Road, for and in behalf of the Baltimore and Ohio Rail Road Company, of the second part, WITNESSETH, that the said party, of the first part, for , heirs, executors and administrators, doth hereby covenant, promise and agree, to and with the said Caspar W. Wever, superintendent as aforesaid, that the said party of the first part, shall and will, well and faithfully, in a mechanical and workmanlike manner, on or before the day of in the year 183, build, finish and complete in the manner and on the

conditions herein before mentioned, all such bridges, gothic and common culverts and detached walls, as the superintendent may direct, on the aforesaid section of road, that is to say, the gothic and common culverts and detached walls, on or before the day of 183 ; all circular arched bridges, on or before the day of

183 . And the said party of the first part, shall remove all such earth, stone, sand, gravel, timber, or other material which, in the opinion of the superintendent, obstruct the free passage of the water to, under and from such bridges and culverts as may be built in pursuance of these articles of agreement.

ON CONDITION WHEREOF, the said Caspar W. Wever, superintendent as aforesaid, for and in behalf of the Baltimore and Ohio Rail Road Company, doth hereby covenant, promise and agree to and with the said party of the first part, his heirs, executors and administrators, that the said Company, by their superintendent, shall and will, for doing and performing the work aforesaid, well and truly pay to the said party of the first part, his heirs, executors or administrators, at the rate of

 dollars and cents, for each and every perch of twenty-five cubic feet, which the arched bridges may contain; and at the rate of dollars and

 cents, for each and every perch which all gothic and common culverts and detached walls may contain. The whole to be measured by the superintendent for the time being, whose measurement shall be final and conclusive. Payment to be made in the following manner:—that is to say—Each and every month during the progress of the work, the said Company will pay three-fourths of the relative value of the work done, to be judged of by the superintendent, until the whole of the masonry hereby contracted for, shall have been finished and completed agreeably to contract, and shall have been accepted by the superintendent as so finished and completed, when the unpaid balance shall forthwith be paid to the said party of the first part, his heirs, executors or administrators.

The said party of the first part, shall have the right and privilege to quarry stone for the masonry hereby contracted for, on any part of the line of said road, and to haul the same or any other stone over such parts of said road as may be levelled, provided he does not damage said road. In case the said party of the first part, shall damage said road, by quarrying

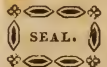
stone therein or hauling over the same, he shall be charged with such amount of money as the superintendent may assess.

And the said party of the first part, for himself, his heirs, executors and administrators, further covenants and agrees with the said Caspar W. Wever, superintendent as aforesaid, that in case the said party of the first part, shall not well and truly, from time to time, comply with and perform all the covenants herein before stated and stipulated on his part to be done, performed and complied with, in manner and form, and within the time herein before mentioned; or in case it should appear to the superintendent, for the time being, that the work does not progress or go on with sufficient speed—that the superintendent shall have power to determine that this contract has been abandoned, and in the event of such determination being made by the superintendent, the foregoing agreements on the part of the party of the second part, and every clause and part thereof, shall become null and void, and that the unpaid fourth part of the relative value of the work done, shall be forfeited by the said party of the first part, and become the right and property of said party of the second part; and further that the said Company shall be at liberty, and have full right and authority, any thing herein contained, to the contrary, notwithstanding, to employ and set to work, or contract with any person or persons whomsoever, in the place and stead of the said party of the first part, and without any interruption or interference from the said party of the first part, or his heirs, executors or administrators.

IN WITNESS WHEREOF, the said Caspar W. Wever, superintendent as aforesaid, acting for and in behalf of the Baltimore and Ohio Rail Road Company, hath hereunto set his hand and affixed his seal of office, and the said

hath
hereunto set hand and seal the day and year first
herein before written.

*Signed, sealed, and delivered }
in the presence of }*



(Z.)

To Contractors.

That part of the third division of the Baltimore and Ohio rail road to be now let, commences at the end of the graduated road bed about three miles east of Ridgeville, and extends to the summit of Parr's ridge.

That part of the 4th division now to be let, begins on the summit of Parr's ridge, and terminates a few hundred feet east of Plummer Ijam's mills.

The graduation is required to be finished on or before the 1st day of October next.

The superintendent reserves the right of changing either the vertical or horizontal position of the road. Such changes shall be made on equitable principles.

No ardent spirits to be kept or used on or near the road. This requisition will be most rigidly enforced.

The price proposed per yard is to be considered for the excavation or embankments, as the one or the other may be greater in quantity, and to be in full for all the work necessary to effect the graduation, viz: grubbing, clearing, excavating, embanking and levelling. The company guarantees against the occurrence of rock requiring *blasting*, and if any such should be met with in the excavation it will be paid for at the estimate of the superintendent.

It is proper to apprise contractors that a fulfilment of the contract within the time specified, will be expected without fail; and that no extra allowance except for extra work and for *blasted* rock, will be made in any case. Contractors will therefore, it is earnestly hoped, be cautious and careful in making their bids.

Culverts of from one and a half to four feet span of rough dry masonry, and also rough dry walls may be proposed for.

The company have found copartnerships vexatious. If then there are more than one concerned in a bid, they can let one represent them in his individual name, and he alone will be acknowledged as the contractor, in case the bid is accepted. The proposal of course will be signed by a single individual.

The proposals sealed and directed to the subscriber, may be left at his office in Frederick, at the tavern of Mr. Brengle, Ridgeville, or at the taverns of Mr. Wirtenbaker or Mr. Owings, New Market. The contract will not be determined before the 15th instant, when the successful bidders will be advised. No proposals will be received after the evening of the 10th instant.

CASPAR W. WEVER, *superintendent.*

1st of June, 1831.

An exhibit.

Of the number and length of the sections and of the quantum of excavation and embankment on each.

No. of division.	No. of section.	Station of commencement.	Station of termination.	Length of section in feet.	Cubic yards of road excavation.	Cubic yards of embankment.	Cubic yards of canal excavation.	Total cub. yds. of excavation of all kinds.
3	36	2009	2028	1,900	2,817	6,809		2,817
"	37	2028	2050	2,200	3,479	7,617	379	3,858
"	38	2050	2089	3,909	20,715	23,405	3,629	24,346
"	39	2089	2111	2,201	11,191	18,465		11,121
"	40	2111	2132	2,173	9,323	10,646		9,323
"	41	2132	2152	2,000	7,390	8,897		7,390
4	1	2152	34	3,800	22,151	20,971		22,150
"	2	34	67	3,217	8,830	7,545		8,830
"	3	67	103	3,676	12,906	16,968	574	13,480
"	4	103	145	4,200	9,326	11,462	226	9,552
"	5	145	180	3,500	7,071	6,028		7,071
"	6	180	222	4,200	5,734	4,334		5,734
"	7	222	243	2,100	4,547	14,380		14,547
"	8	243	270	2,700	7,258	7,342		7,258
"	9	270	303	3,300	1,785	12,184		11,785
"	10	303	323	2,000	7,746	7,660		7,746
"	11	323	355	3,200	11,520	10,691		11,520
"	12	355	380	2,500	19,041	16,653		19,041
"	13	380	412	3,200	13,304	14,554		13,304
"	14	412	435	2,300	6,983	9,129	874	7,857
"	15	435	450	1,500	3,740	9,902	3,312	7,052
"	16	450	482	3,200	12,385	14,670	3,115	15,500

PROPOSAL.

I will graduate the following sections of the 3d and 4th Divisions of the Baltimore and Ohio Rail Road, and build the necessary culverts and dry walls on them, at the prices annexed.

No. of Division.	No. of Section.	Price in cents per Cubic yard.	Price per perch of 25 Cubic feet of culverts in dollars and cents.	No. of Division.	No. of Section.	Price in cents per Cubic yard.	Price per perch of 52 cubic feet of culverts in dollars and cents.
3	36			4	5		
	37				6		
	38				7		
	39				8		
	40				9		
4	41				10		
					11		
	1				12		
	2				13		
	3				14		
	4				15		
					16		

And I will undertake to complete said sections and masonry on or before the 1st day of October, 1831.
The name of my nearest post-office is _____ and state of _____

First Annual Report of the Superintendent of Transportation.

Office of Transportation,
Baltimore and Ohio Rail Road, }
October 1st, 1831. }

PHILIP E. THOMAS, Esq.
President,

SIR,

Having, in addition to my duty as auditor, been appointed superintendent of Transportation on the Rail Road, I respectfully submit to you the accompanying documents, as the result of the operations in that department from the 1st January to the 30th September of this year.

In the tables marked I. J. are presented, respectively, detailed statements of the amounts received for the Transportation of persons and of tonnage;—and in that marked K, is shewn the aggregate revenue arising from both those sources, during each month of the period stated above, amounting to the sum of \$31,405 24.

In the document marked L, is exhibited a return of the actual expenditures by the Company, under the head of “expenses of transportation,” amounting to \$10,994 87; it embraces all the disbursements of this department during the period above referred to; but these, as will be perceived, do not include any charges for the construction, the repairs or the wear and tear of wagons and cars,—that branch of the service of the Company being under the immediate care and superintendence of a committee of the board.

It will be observed that the expenditures are to the receipts as nearly 1 to 2.86, or about 35 per cent.

This ratio although greatly reduced below that of last year, is still high, and from causes which will be explained, probably higher than it will be at any future period.

The whole revenue of the Company having, until lately, been almost exclusively derived from passengers, attracted to the road by novelty or amusement, has necessarily been extremely fluctuating and dependent on a variety of contingencies: whilst the expenses unavoidably attendant upon the uniform maintenance of a moving power calculated to meet the demands of the public on days of activity, although such days occur irregularly, have been great and of daily recurrence. The expediency of sup-

porting an establishment of this magnitude, calculated to meet a great, rather than a medium, demand for transportation, may be explained by the fact that, if the moving power had been materially reduced, the public accommodation would in consequence have been seriously and inconveniently curtailed;—and that, although by such reduction the ratio of the expenses to the receipts might have been improved, the *net* revenue would not in any degree have been increased by it.

As another cause of the high rate of expenses, it may be remarked that some of the charges, on the department of transportation, will not be increased on the further extension of the road, or by a great addition to its commerce;—and that so far from the expenditures continuing to advance proportionally with the income, they will, at each augmentation of traffic, relatively recede from each other.

Under the disadvantages arising from the circumstances referred to, the disbursements have to the revenue been comparatively high, and as they were permitted to be so from considerations of convenience and expediency, rather than from necessity, no correct criterion can be established from them of the general cost of transportation by this system of intercommunication.

For some months past a series of experiments have been made, with the view of ascertaining, practically, the force of traction, at a slow draft, horses can exert consistently with the preservation of their vigour and health.—It has been found that, graduated as this road is, and each horse moving at the rate of 3 miles per hour, he can daily traverse the 13 miles westwardly with 7 tons; and returning, he can transport $10\frac{1}{2}$ tons;—being equal to $227\frac{1}{2}$ tons gross drawn one mile daily by each horse.

In a quick draft, it has been established, after an experience of several months, that a speed of 10 miles an hour may be sustained without any injury whatever,—each horse transporting a car with its load weighing from 3 to $3\frac{1}{2}$ tons, 13 miles per day, divided into stages of about $6\frac{1}{2}$ miles each.

Without, therefore, adverting to the superior power and speed attained by means of steam, it is gratifying to know, that independently of the agency of that powerful auxiliary, the transportation of tonnage can be effected at an exceedingly low rate, and that the conveyance of persons along any extended line of road can be accomplished, with ease and certainty, at a speed, including stoppages, of 10 miles per hour.

The limited extent of Railway hitherto in operation, and the trouble, expense and delay attendant upon a removal at the Depot, to other vehicles, of the commodities transported upon it,

have tended to retard a full adoption of its facilities for the general purposes of trade,—the use of it has consequently been almost exclusively confined to articles either produced, or to be used, on its immediate line,—and although the tonnage now conveyed on the road, amounts to upwards of 1100 tons per month, it may be considered as a commerce, created entirely by the cheapness of this system of communication,—in commodities too, which, without its facilities and economy, would have remained totally unavailable to the public.

This result is the more gratifying as it is an evidence of the extent and value of the addition which will hereafter be made to the ordinary and established tonnage of the country, from resources which are now only beginning to develope themselves.

Respectfully submitted,

W. WOODVILLE,

Auditor & Supert. of Transpt.

STATEMENT of the Revenue received for the transportation of Passengers on the Baltimore and Ohio Rail Road, and of the number transported from the undermentioned places, respectively, from the 1st of January to the 30th September, 1831.

REVENUE FROM PASSENGERS.

[I.]

During the month of	Baltimore.		Relay House.		Ellicotts' Mills.		For the Frederick and Washington Stage Lines.		Total.	
	Passengers	Amount.	Passengers	Amount.	Passengers	Amount.	Passengers	Amount.	Passengers	Amount.
January, . . .	1356	\$ 377.11	438	\$ 86.37	728	\$ 263.25	344	\$ 74.36	2,866	\$ 801.09
February, . . .	1031	330.68	423	84.16	679	243.94	428	93.37	2,561	752.15
March, . . .	3312	837.60	621	158.36	1855	679.37	624	149.15	6,412	1824.48
April, . . .	3567	1233.28	902	229.04	2939	1068.24	686	183.40	8,094	2713.96
May, . . .	6107	1940.42	961	246.70	4545	1621.41	876	249.17	12,489	4057.70
June, . . .	5506	1843.52	890	231.75	4599	1666.69	1018	316.25	12,013	4058.21
July, . . .	6650	2349.50	958	250.92	4568	1676.66	1338	418.92	13,514	4696.00
August, . . .	5697	2045.77	917	242.72	4622	1669.60	1496	464.31	12,732	4422.40
September, . .	4585	1687.42	932	291.54	3741	1363.67	1966	581.12	11,224	3923.75
Total,	37,811	12,645.30	7,042	1,821.56	28,276	10,252.83	8,776	2,530.05	81,905	27,249.74

STATEMENT of the Revenue received for the Transportation of Tonnage on the Baltimore and Ohio Rail Road, and of the quantity of Tonnage transported, from the 1st of January to the 30th of September, 1831.

REVENUE FROM TONNAGE.

[J.]

During the month of	Eastwardly.		Westwardly.		For the hire of wagons & for small freight.		Total.	
	Tons.	Amount.	Tons.	Amount.	Amount.	Amount.	Tons.	Amount.
January, . .	18.25	\$ 6.90	86.50	\$ 56.90	—	—	104.75	\$ 63.80
February, . .	57.50	22.39	152.	91.31	\$ 23.70	—	209.50	137.40
March, . .	427.	156.16	147.	102.08	57.80	—	574.	316.04
April, . . .	368.63	161.27	305.96	225.10	76.81	—	674.59	463.18
May, . . .	346.67	167.18	330.74	245.26	74.17	—	677.41	486.61
June, . . .	448.44	213.94	230.05	167.55	168.92	—	678.49	550.41
July, . . .	435.25	158.64	275.	192.82	142.53	—	710.25	493.99
August, . .	831.53	442.26	298.76	208.29	129.25	—	1,130.29	779.80
September, .	943.16	517.05	228.60	165.03	182.19	—	1,171.76	864.27
Total.	3876.43	1845.79	2054.61	1454.34	855.37	—	5931.04	4155.50

Statement of the Aggregate Revenue received for transportation on the Baltimore and Ohio Rail Road, and of the aggregate transportation of persons and of tonnage, from the 1st of January to the 30th September, 1831.

AGGREGATE REVENUE.

[K.]

During the month of	From Passengers.		From Tonnage.		Total amount.
	Passengers.	Amount.	Tons.	Amount.	
January,	2,866	\$801 09	104.75	\$ 63 80	\$ 864 89
February,	2,561	752 15	209.50	137 40	889 55
March,	6,412	1,824 48	574.	316 04	2,140 52
April,	8,094	2,713 96	674.59	463 18	3,177 14
May,	12,489	4,057 70	677.41	486 61	4,544 31
June,	12,013	4,058 21	678.49	550 41	4,608 62
July,	13,514	4,696 —	710.25	493 99	5,189 99
August,	12,732	4,422 40	1130.29	779 80	5,202 20
September,	11,224	3,923 75	1171.76	864 27	4,788 02
Total,	81,905	27,249 74	5931.04	4155 50	31,405 24

RECAPITULATION.

Transportation.	Revenue.
81,905 Passengers.	\$27,249.74
5,931. ⁴ / ₁₀₀ Tons.	4,155.50
Total	\$31,405.24

STATEMENT of the Expenses of Transportation on the Baltimore and Ohio Rail Road from the 1st of January to the 30th of September, 1831.

EXPENSES OF TRANSPORTATION.

[L.]

During the month of	Moving Power.	Drivers and engine men	Agents and conductors.	Depot expenses.	Oil.	Contingencies:	Total.
January,	\$ 286 33	\$ 133 68	\$ 195 56	\$ 100 63		\$ 61 75	\$ 780 95
February,	345 75	136	181 07	98 01			763 83
March,	376 73	164 75	172 50	121 38	\$ 67 39	30 50	936 25
April,	602 16	129 50	175 50	67 94			975 10
May,	624 71	156 22	201 35	124 42			1109 70
June,	701 54	196 12	232 50	136 59		64 25	1331
July,	911 96	186 36	258 55	155 15	110 50	151 85	1801 37
August,	851 29	292 89	229 07	115 26	77 09	109 83	1675 43
September,	826 08	367 93	219 22	144 01		61	1618 21
Total,	5526 55	1763 45	1901 32	1066 39	254 98	482 18	10,994 87

RECAPITULATION.

Moving power,	\$ 5,526 55
Drivers and engine men,	1,763 45
Agents and conductors,	1,901 32
Depot expenses,	1,066 39
Oil,	254 98
Contingencies,	482 18

Total, \$10,994 87